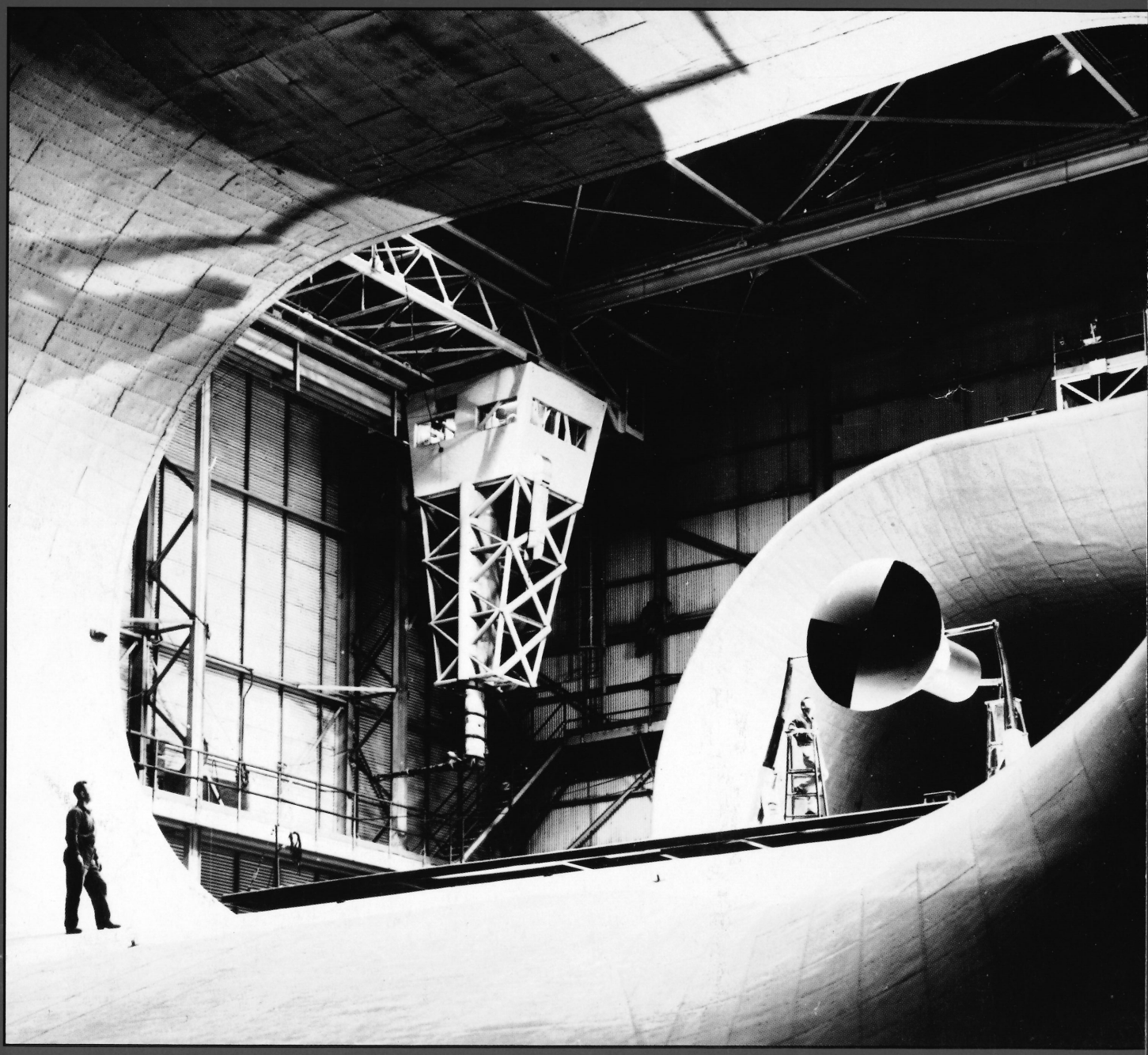
Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities



Advisory Council on Historic Preservation

Balancing Historic Preservation Needs
with the Operation of
Highly Technical or Scientific Facilities

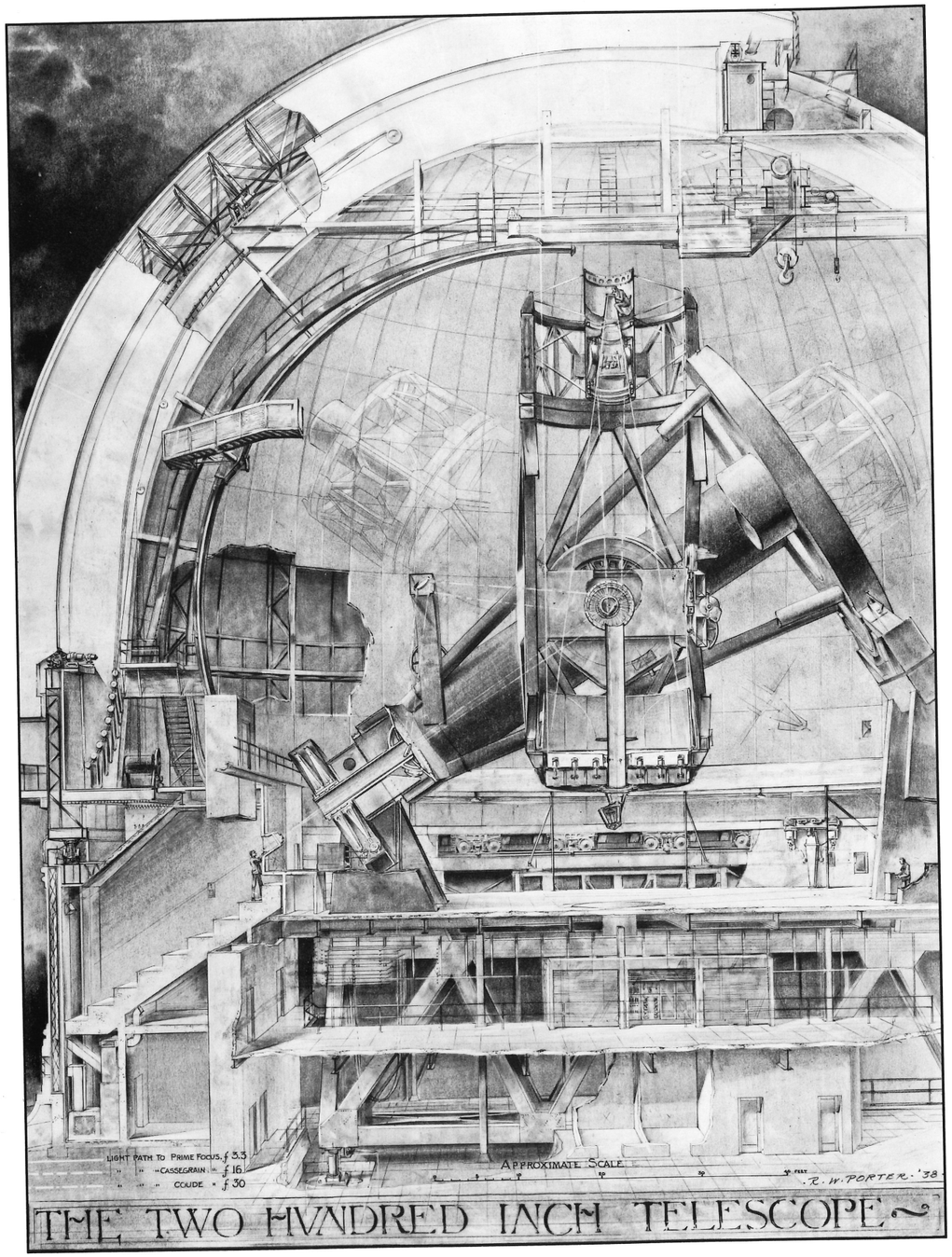
The grand scale of America's historic scientific facilities and equipment is in keeping with their enormous contributions to the Nation's technological development. On the cover, a model of the Mercury capsule undergoes aerodynamic testing in the full scale tunnel at NASA's Langley Research Center. The National Historic Landmark wind tunnel dwarfs a foreground observer in this 1959 photograph. Above, an astronomer sits in the prime focus observing position atop the 200-inch Hale Telescope at the Mount Palomar Observatory, yet the seemingly more human scale of this photograph is deceptive. The detailed diagram of the telescope shown on the overleaf puts man into perspective.

Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities

A report to the
U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
SUBCOMMITTEE ON NATIONAL PARKS AND PUBLIC LANDS, and the
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Advisory Council on Historic Preservation

1100 Pennsylvania Avenue, NW., Suite 809, Washington, D.C. 20004
February 1991



Foreword

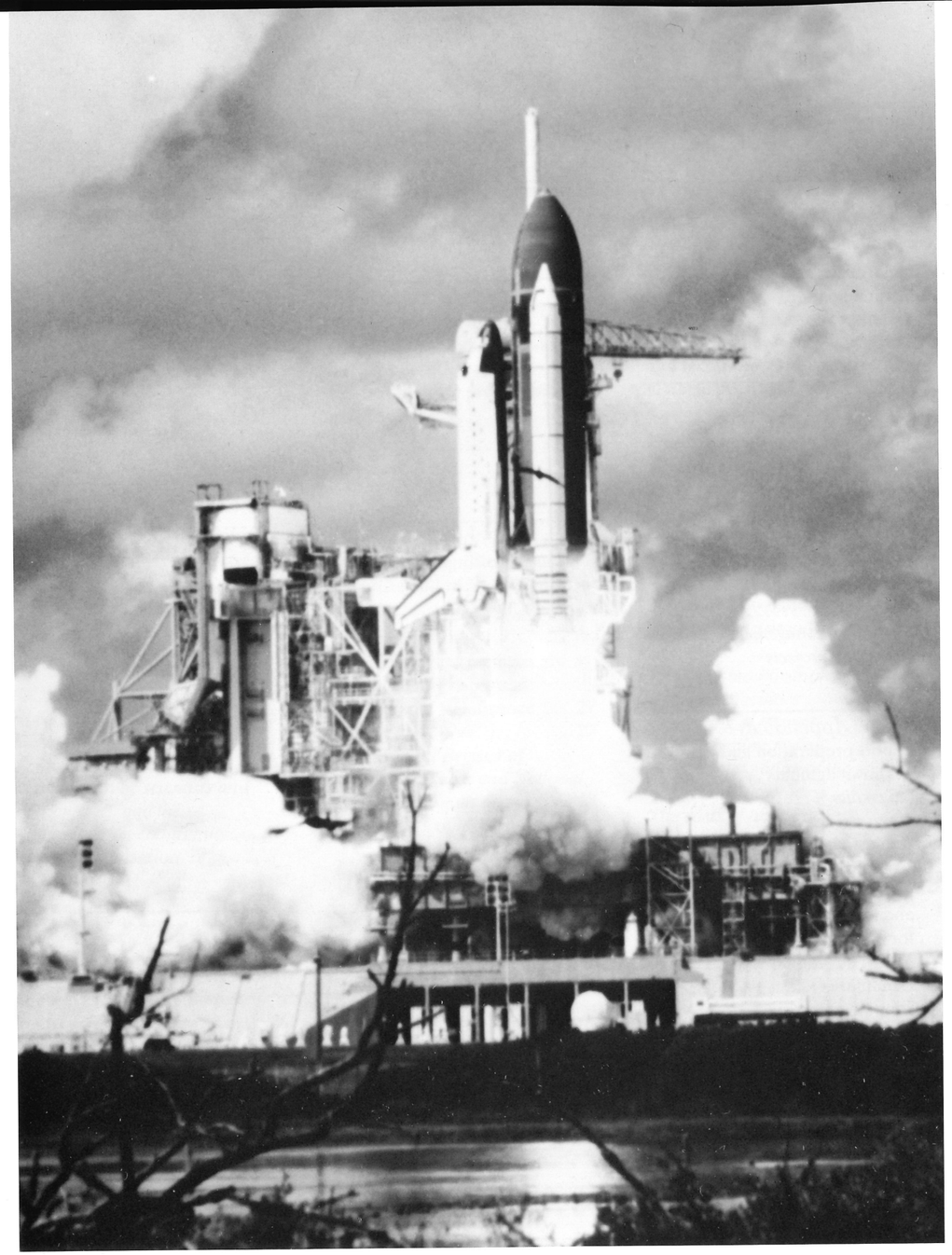
NEARLY TWENTY-FIVE YEARS following passage of the National Historic Preservation Act of 1966, one might argue that the preservation community is stretching the frontiers of traditional historic preservation interests and involvement. We are entering a period that marks fifty years since the beginning of World War II and its aftermath. The 1940s and 1950s marked a period of unprecedented national growth and development in urbanization, residential and commercial construction, scientific and technological development, and national infrastructure. The Nation's historic preservation policy was a response to those developments and their effects on America's historic resources. In the near future, however, the products of those developments will be the historic resources. Already, significant national achievements in science, space exploration, and many other arenas of human endeavor are being recognized for their historic value. Others will follow.

The preservation of our scientific heritage, the discoveries we as a country of innovators and inventors have pioneered, and our physical record of scientific research are all essential to give the proper understanding of "who we are" as a Nation. In particular, the opportunity to inspire and guide the younger generation of Americans is an opportunity we ought not to sacrifice.

I believe this report addresses a variety of measures that can be taken, short of legislative exceptions, to minimize the fears of cost, delay, and interference with the scientific research process that some members of the scientific community believe are necessary when they are asked to participate actively in the preservation of their own past for our common benefit. It is incumbent upon all of us to work together to protect and enhance this legacy as we move forward into the twenty-first century.

John F.W. Rogers
Chairman

Table of Contents



The space shuttle lifts off from Launch Complex 39 at Kennedy Space Center, one of NASA's historic properties that is listed on the National Register for its role in the lunar landings. The complex has been modified for shuttle operations. On the overleaf, Marshall Space Flight Center's NHL neutral buoyancy simulator, constructed in 1955 to train astronauts to work in a weightless environment, also remains in use. In this 1979 photograph, scuba divers keep a watchful eye.

Executive Summary

IN RESPONSE TO A JOINT REQUEST FROM THE HOUSE Committee on Interior and Insular Affairs, Subcommittee on National Parks and Public Lands, and the House Committee on Science, Space, and Technology, the Advisory Council on Historic Preservation undertook an analysis of preservation issues concerning Federal support for highly scientific and technical facilities. The analysis considered the appropriate role of historic preservation in decisionmaking about the operation and management of these facilities.

When future generations reflect upon the most significant historic resources of the late 20th century, the sites associated with man's first ventures into space, with the splitting of the atom, with the development of computers and artificial intelligence, and with the first successful products of genetic engineering, may well be the first examples that spring to mind. America's scientific and technical facilities stand as monuments to the Nation's supreme ability to invent and exploit new technology and to advance scientific and engineering knowledge. Some facilities and structures significant in the early history of science and technology are now inactive or have been deemed obsolete; they are in danger of being lost to future generations through lack of adequate maintenance or complete neglect.

This analysis responds to concerns on the part of the scientific community that efforts to preserve or protect historic scientific and technological resources through compliance with Federal historic preservation law might impede efforts to stay at the forefront of international research and achievement. Many of the facilities and much of the equipment associated with scientific or engineering advancements remain in active use today, but need to be continuously upgraded and modified to stay at the cutting edge of technology. Managers and scientists fear that excessive delays, costs, or the modification or "veto" of plans for new technological facilities would inevitably result from compliance with the National Historic Preservation Act (NHPA). In addition, private institutions receiving Federal support through research grants have pointed out that such compliance would impose a burden on them to bear these monetary and other costs as a condition for receiving research funds.

Given the late-20th-century's pattern of rapid technological change, however, the protection of the physical environment that facilitated that change takes on increased importance. Federal agencies managing or assisting scientific research have a leadership role in the stewardship of historic properties under NHPA. They are obligated to present and future generations, whose tax dollars will continue to fund their operations, to consider the effects of their actions on the historic values embodied in select facilities.

The central issue discussed in this report is how organizations whose primary missions involve active research and highly technical operations can meet their obligations as stewards of the nation's historic scientific resources, given their continuous need to modify or replace "historic" facilities and equipment. What is the appropriate balance between an agency's primary scientific and technical mission and historic preservation? How can this balance be achieved effectively and efficiently, and how can attendant costs be minimized?

The number of properties formally recognized as significant for historic scientific and technological achievements currently is fairly small. The vast majority of scientific research activities is unlikely to affect historic properties through destroying or altering their historic characteristics. Most Federal funding is used for purchasing equipment and computer time and paying staff salaries. A small minority of such activities, however, does have the potential to affect historic properties. Certainly long-term operation and management of active facilities can result in significant alterations. Further, the number of

historically significant scientific properties is likely to increase in the near future as the era of World War II and its aftermath recede further into the past.

The findings and recommendations contained in this report are based on field visits to numerous affected facilities, as well as meetings with scientists, engineers, historians, facility managers, museum curators, and preservation professionals; solicitation of public comments; review of past Section 106 cases and existing agency programs; and review of National Park Service research for the preparation of two relevant National Historic Landmark theme studies.

The analysis finds in brief that:

☐ **The assumption that the NHPA is fine for the majority of Federal activities, but inappropriate for scientific research and development, must be rejected.** Other Federal programs meeting national priorities must take into account historic preservation, just as they must minimize natural environmental degradation and ensure equal employment opportunity. There is validity, however, to the view that because of the nature of the scientific research process, a special effort should be made toward maintaining flexibility in the planning and execution of research work and meeting the time constraints of priority programs.

☐ **Federal agencies engaged in scientific research should better acknowledge and meet their obligations as stewards of the national scientific heritage and strengthen their commitment to the preservation of that legacy.**

☐ **The historic preservation community has characteristically displayed unfamiliarity with the technical characteristics of historically significant properties of a scientific or technical nature, and the needs of active scientific research and engineering.**

☐ **The scientific community has typically displayed unfamiliarity with the requirements of NHPA and the interests of the historic preservation community.**

☐ **With better communication, education, and cooperation among all parties, and with some clear understandings on funding and time constraints facing all parties, the Council's regulations and the Section 106 review process are flexible enough to accommodate the needs of both scientific research and technology operations and historic preservation.**

Highlights of the recommendations:

■ *Congress should reaffirm the national commitment to historic preservation by upholding the existing national historic preservation program and rejecting individual program or project requests for legislative waivers of historic preservation statutes.*

■ *Future scientific achievement, as well as an adequate serving of the public interest, depends on an understanding of past scientific successes and failures. To the extent that they do not already, future authorizations for major scientific and technological programs should include public education components focusing in part on the communication of the relevant history of science.*

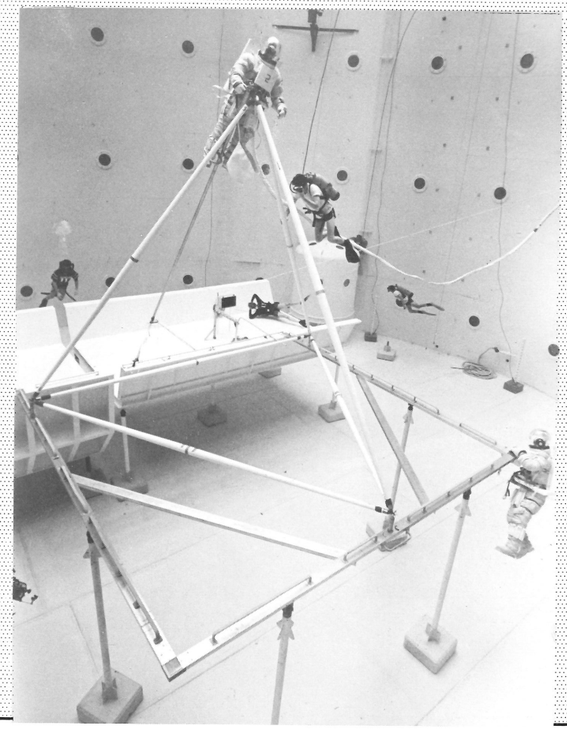
■ *Decisions about projects that may affect historic properties need to be made with as complete an understanding as possible of such effects. However, considerations of preservation options should be kept distinct from the peer review process of awarding research grants and the determination of research priorities central to the scientific research process.*

■ *The Advisory Council on Historic Preservation and affected Federal agencies should jointly subscribe to a statement of policy that acknowledges the sensitive relationship between scientific research and the evolving history of science and its physical manifestations.*

■ *Over the next two years, affected Federal agencies, in cooperation with the Advisory Council on Historic Preservation, should examine current administrative procedures for historic preservation. This should include evaluating existing mechanisms for meeting responsibilities for NHLs and other properties eligible for or listed on the National Register of Historic Places. As part of this process, affected Federal agencies should determine how they might better coordinate historic preservation programs and planning among facilities managers, public affairs offices, archivists, historians, external affairs offices, and other staff. The Council should recommend measures to these agencies to improve the effectiveness, consistency, and coordination of those procedures with the purposes of NHPA as prescribed by Section 202(a)(6).*

■ *Innovative ways for minimizing and meeting the costs of historic preservation that may be associated with the operation and management of historic facilities must be explored by Federal agencies, in cooperation with other concerned parties.*

■ *The Advisory Council on Historic Preservation, in cooperation with the Smithsonian Institution and NPS, should foster better communication between the preservation and museum communities and Federal agencies, with the aim of establishing a consensus about what kinds of facilities and objects should be physically preserved for the future. This would include deciding how the historic value of facilities and objects should be determined, and which of these could be "preserved" through documentation. Most probably that option would be best suited to historic facilities that remain active today.*



CHAPTER 1:

Introduction

As requested by Congress on September 20, 1989, the Advisory Council on Historic Preservation undertook an analysis of problems, or potential problems, associated with the designation of scientific research institutions as historically significant for their role in scientific and technological advancement.

Of concern was how a balance could be struck between the preservation of physical reminders of the scientific legacy of the United States and the ongoing operation and continual need to upgrade scientific and technical research facilities.

Congress requested that the Council focus on properties identified by the National Park Service (NPS) as nationally significant under the "Man in Space" and "Astronomy and Astrophysics" National Historic Landmark (NHL) theme studies. It also asked the Council to suggest how Federal agencies managing or providing assistance to such facilities could best meet the requirements of Sections 106 and 110 of the National Historic Preservation Act (NHPA) and Council regulations, "Protection of Historic Properties" [36 CFR Part 800].

No additional funding was provided to conduct this study; all work was accomplished within the Council's normal operating budget. Congress requested that the report be completed by September 30, 1990. In order to complete review of the report by the Council at its October 17, 1990, quarterly meeting, an extension was granted until October 31, 1990.

Congressional request

The September 20, 1989, letter, conveying the joint request from the House of Representatives, Subcommittee on National Parks and Public Lands of the Committee on Interior and Insular Affairs, and the Committee on Science, Space, and Tech-

The range of historic scientific properties is vast, as is the range of preservation options: the original Thomas Edison laboratory, left, is now a national historic site. Even more challenging from a preservation standpoint are properties such as Cape Canaveral's numerous launch complexes, many of which are still in use.

nology, asked the Council to conduct a comprehensive analysis that would include, but not be limited to, the following issues:

- **Ways to balance the needs of historic preservation and facility operation at highly technological and/or scientific facilities;**
- **Impediments to achieving such a balance, such as time delays and security concerns and approaches to minimize such impediments; and**
- **Procedures to ensure that both historic preservation and scientific/technological communities continue to assist each other in the development and execution of agreements that fulfill the respective needs of historic preservation and facility operation.**

The Committees specified that preparation of the analysis must include the active participation of the Federal agencies and their grantees and contractors, as well as the historic preservation community and active scientists and managers. The Council focused on the properties identified in the two NHL theme studies, "Man in Space" and "Astronomy and Astrophysics." Other historic operational facilities, as well as recognized or eligible historic properties located at or within operational facilities, were included in the analysis as appropriate. In all cases the study emphasized active, as opposed to inactive, facilities.

Background to congressional interest

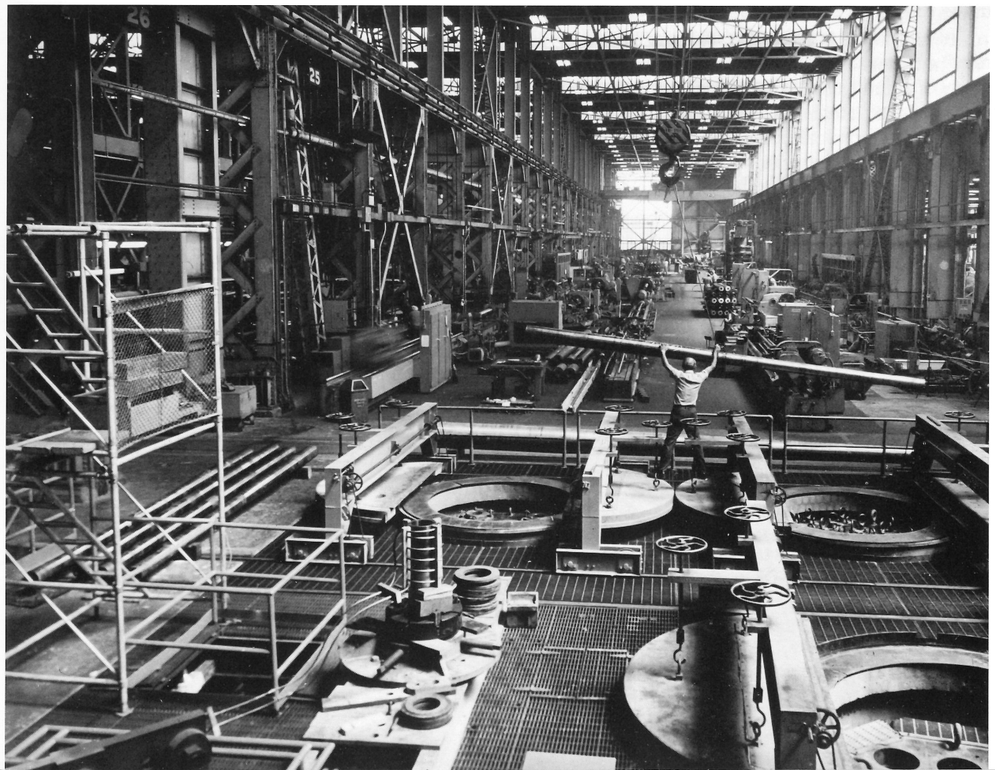
In the mid-1980s, NPS studied properties instrumental to the United States' placement of a man on the moon. Based on this study, 25 properties owned by the National Aeronautics and Space Administration (NASA), the Air Force (USAF), the Army (Army), and the Smithsonian Institution (SI), including facilities, structures, and objects of space hardware, were determined to hold national historic significance for their role in that achievement. NHL facilities range from Cape Canaveral rocket-launch pads to rocket-engine test stands, to wind tunnels, to one of the Saturn V rockets. A partial list of these properties and others can be found at page 75 of this report.

Agency objections were made to the "Man in Space" designations on the grounds that (1) research leading to the designations was incomplete or inaccurate, and (2) such designations would place additional demands on money, manpower, and time, and impede respective agency missions.

As a result of these objections, discussions began between NASA and the Council on a Programmatic Agreement (PA) in order to comprehensively address NASA's responsibilities under Sections 106 and 110 of NHPA. (See Chapter 2 for a discussion of the Section 106 process.)

Negotiations leading to the PA were lengthy and difficult. NASA was concerned that compliance with NHPA must not interfere with cost-effective and timely execution of its primary mission. Many preservationists, on the other hand, felt that NASA had a strong obligation to preserve the physical manifestations of its scientific achievements and that this responsibility currently was not adequately acknowledged. The Council sought a middle ground that would allow NASA to go forward with its mission while still discharging its statutory responsibilities under NHPA.

Twenty-five NASA-owned properties, including this Saturn V rocket engine test stand, left, at the Marshall Space Flight Center, have been designated as National Historic Landmarks, the Nation's highest landmark designation. An entirely different kind of technologically significant historic property is Watervliet Arsensal's Building 135. Built during World War II, it is still used for the manufacture of large gun barrels.



During the consultation process preceding the PA, NASA requested a legislative exemption from compliance with NHPA. As part of a negotiated compromise involving representatives of NASA, the Council, the Office of Management and Budget (OMB), and the staffs of both House committees, on September 18, 1989, Council Chairman John F. W. Rogers executed a PA among the Council, NASA, and the National Conference of State Historic Preservation Officers (NCSHPO) for the management and operation of facilities designated by NPS as NHLs.

In the closing days of Fiscal Year 1989, however, a provision was inserted into the Council's FY 1990 appropriations which barred it from expending funds to comment on undertakings at facilities engaged in scientific and technical research and development under Federal contracts or grants.[1]

This provision was the direct result of a second major NPS study of scientific facilities, this time centered on historically significant astronomical observatories and astrophysics facilities. The affected institutions objected that designation of certain observatories as NHLs would inhibit scientific research, largely because of the implications for compliance with Section 106 of NHPA should NHL status be conferred. In meetings of the National Park System Advisory Board and its History Areas Committee, testimony was heard from the National Science Foundation (NSF) and the targeted institutions that argued against NHL designation.

Eventually, these objections reached Congress. One result was the amendment to the Council's appropriation bill, described above. A second result was the joint congressional committee request to the Council for the conduct of this study. A third result was a congressional request to NPS, made at the same time as the request to the Council, to suspend further action on possible NHL designations for six months. NPS agreed. Eventually, NPS determined that it would not revisit this issue pending completion of the Council's study. On December 20, 1989, the Secretary of the Interior did, however, designate seven properties to which no objections had been raised (none are currently state-of-the-art facilities) as NHLs under the "Astronomy and Astrophysics" theme. Designation of an additional eight properties was postponed indefinitely.[2]

Focus of the study

Given the conflicting needs and breadth of issues concerning historic preservation and the operation of scientific and technological facilities, the Council has focused this study on properties of historic significance that are also either (1) active "pure" or "applied" research facilities carrying out essential, often state-of-the-art, research and development; or (2) active "frontline" operational facilities engaged in programs supporting scientific or defense-related missions.[3] Federal installations and nonprofit public academic institutions receiving some form of direct Federal grant support for their activities have been emphasized over privately owned and managed corporate facilities engaged in Federal contract work for profit. With the exception of several examples for comparative purposes, this report minimizes consideration of historic preservation in the private, corporate defense/research and development sector.

Inactive facilities, facilities that have been substantially modified or changed from their original purpose and function, or installations engaged in operations involving uses of "normal" technology in a particular engineering field, e.g., power plants, have been considered during the course of this study but have received substantially less attention because they are only tangentially relevant to the congressional request and issues motivating it. This is also true of historic resources like prehistoric archeological sites that exist within the boundaries of scientific or technical installations.[4] While such resources certainly should be managed as significant cultural resources and considered during planning and execution of new or ongoing projects, these resources typically are not of historical significance for their scientific or engineering contributions.

Facilities receiving less attention in this report include, for example, the launch complexes at Cape Canaveral Air Force Station, Florida, which are no longer active facilities, and, in many instances, are represented only by concrete pads and abandoned support structures; the original and historically significant hydroelectric plants that are now part of the Tennessee Valley Authority (TVA) system; as well as the considerable number of prehistoric archeological sites located within the perimeter of the DOE facilities at Savannah River, South Carolina, Los Alamos, New Mexico, and Hanford, Washington.

1 This amendment was renewed for Fiscal Year 1991.

2 These additional properties include Palomar's 200-inch reflector and 48-inch Oschin [Schmidt] telescopes, the Mount Wilson Observatory, the Lick Observatory Building and the Lick Crossley 36-inch reflector telescope, the Allegheny Observatory, the Yerkes Observatory, and the U.S. Naval Observatory.

3 The Council's experience to date with both groups of active facilities under Section 106 is extremely limited; see Chapter 5.

Study methodology

Overall approach

To ensure balanced consideration of the potential place of historic preservation in the operation of scientific and technological facilities, this study explored several lines of inquiry.

First, a presentation was made to the Council at its February 1990, meeting in Washington, DC, which included invited testimony from NASA, NSF, NPS, NCSHPO, and the American Astronomical Society (AAS). The Aerospace Industries Association (AIA) was also invited but was unable to send a representative. As a result of that meeting, a three-member task force of Council members, including one Federal agency representative, one expert and one member of the general public, was formed to oversee the study.

Second, the public request for comments on the above questions was printed in the *Federal Register* on March 16, 1990.

Third, an advisory panel of scientists, managers, and preservation professionals convened twice to review issues discussed in this report and provide comments on the draft report.

Fourth, two meetings were held in Washington with staff from the National Museum of American History, Division of Science and Technology, and the National Air and Space Museum of SI.

Fifth, files of past Council and SHPO involvement with scientific and technological facilities under Section 106 of NHPA and NPS research for NHL theme studies were examined.

Finally, field visits were made to a number of Federal and federally supported scientific and technological institutions to assess first hand the kinds of historic resources present and to discuss with field managers and resident scientists ways in which the issues surrounding this study should be addressed.

Solicitation of public comments

In its letter to the Council, Congress asked the Chairman to consider a number of issues in the analysis (page 1, above). These questions were expanded in the Council's request for public comment published in the *Federal Register* on March 16, 1990, and in a memorandum to all SHPOs from the Council's Executive Director dated March 9, 1990. These solicitations asked:

- ☐ **What issues should be considered in striking a balance between the public values of historic preservation and the need for highly technological and/or scientific facilities to respond promptly to changes in technology?**
- ☐ **What are the principal impediments to achieving such a balance, such as the need for continuing changes to facilities to**

4 Unfortunately, it is at these sites that SHPOs and the Council have had more active involvement.

keep up with and advance scientific and technological developments, misunderstanding or other factors leading to delays in the historic preservation review process, and security concerns at facilities, among others, and how can these be managed?

☐ **What procedures can or should be implemented to ensure that both the historic preservation and scientific/technological communities assist each other effectively to ensure that the respective needs of historic preservation and facility operations are met?**

☐ **Where do perceived inadequacies exist in the way in which reminders of this country's scientific legacy are now preserved, and how might they be addressed?**

☐ **Where do opportunities exist to enhance public education in this area through cooperation between the scientific/ technological and historic preservation communities?**

In addition to the above questions articulated in the *Federal Register*, the following additional questions were asked of SHPOs:

☐ **Do you know of such Federal or federally supported facilities within your state?**

☐ **Have they been evaluated for their historic significance? (Have any been formally determined to be eligible for the National Register, by the agency, your office, or NPS, and if so, under what criteria?)**

☐ **Has your office conducted project review(s) of them under Section 106?**

Scientific and technological facilities visited

Council staff visited the following facilities as part of this study:

- *Marshall Space Flight Center, Huntsville, Alabama (NASA)*
- *Alabama Space and Rocket Center, Huntsville, Alabama (State of Alabama)*
- *Redstone Arsenal, Huntsville, Alabama (Army)*
- *Jet Propulsion Laboratory, Pasadena, California (NASA/California Institute of Technology)*
- *Palomar Observatory, San Diego County, California (California Institute of Technology)*
- *Mount Wilson Observatory, Angeles National Forest, California (Mount Wilson Institute)*
- *Goddard Space Flight Center, Greenbelt, Maryland (NASA)*
- *U.S. Naval Observatory, Washington, DC (USN)*
- *Los Alamos National Laboratory, Los Alamos County, New Mexico (DOE)*
- *Yerkes Observatory, Williams Bay, Wisconsin (University of Chicago)*
- *David Taylor Research Center, Bethesda, Maryland (USN)*
- *National Air and Space Museum, Smithsonian Institution, Washington, DC*
- *National Museum of American History, Smithsonian Institution, Washington, DC*

The following additional facilities have been visited by Council staff since 1980 as part of the Section 106 review process.

- *Kennedy Space Center, Cape Canaveral, Florida (NASA)*
- *Johnson Space Center, Houston, Texas (NASA)*
- *Langley Research Center, Langley, Virginia (NASA)*
- *Cape Canaveral Air Force Station, Cape Canaveral, Florida (USAF)*
- *White Sands Missile Range, White Sands, New Mexico (Army)*
- *Watervliet Arsenal, Watervliet, New York (Army)*
- *Hanford Site, Richland, Washington (DOE)*
- *Ocoee 1 and Ocoee 2 hydroelectric plants, near Chattanooga,Tennessee (TVA)*

Participation by scientists and managers, and the preservation community

The Council received written comments on its *Federal Register* notice from the California Institute of Technology (CalTech) and the University of Chicago (UC) as well as six SHPOs. Subsequently, a representative of one Federal agency and one additional SHPO provided specific written comments.

An *ad hoc* advisory panel embracing the Federal, scientific, and preservation communities was also convened by the Council to provide advice and technical assistance during the course of this investigation. Members of the panel reviewed an issues paper and, subsequently, the second draft of this report.

Report organization

Following this introduction, Chapter 2 provides a context for this study, including an overview of the nature of Federal and federally supported scientific research and the Federal historic preservation program.

Chapter 3 discusses several principal areas of potential conflict the Council has identified between the respective goals of scientific research and historic preservation.

Chapter 4 presents information on the historic significance of some scientific and technical facilities, including the criteria used and the normal process of evaluation.

Chapter 5 presents information about past Section 106 review of Federal and federally assisted scientific and technological facilities and assesses current trends in Federal agencies meeting their obligations under Sections 106 and 110 of NHPA.

Chapter 6 describes options available to achieve a more effective balance between preservation concerns and scientific and technical research.

Finally, Chapter 7 outlines conclusions and makes specific recommendations concerning how to better integrate historic preservation with operations of scientific research and technical facilities.

CHAPTER 2:

A context for analysis: Federal support of science and technology and the Federal historic preservation program

Overview

That the United States should do all it can to stay in the forefront of scientific and technological advancement goes without question. One popular response to present-day trade deficits has been to exhort the nation's technical industries to maintain or reestablish leadership in these areas with the hope of regaining international preeminence.

Yet new scientific discoveries and applications, as well as the means to capitalize on them, depend directly upon the scientific community's access to state-of-the-art equipment and facilities.

Clearly scientific institutions and research universities must be able to mobilize the best available equipment and facilities if they are to respond to new and continuing challenges.

At the same time research institutions and facilities must remain sensitive to costs and pursue the most cost-effective research methods and materials as they are developed.

On the other hand, given the late-20th-century pattern of rapid technological advancement, it can be argued that the preservation of the physical environment that facilitated that advancement takes on increased importance. When future generations reflect on the most

When future generations reflect on the most significant historic resources of the 20th century, those associated with this country's first ventures into space may well be paramount. This 1969 photograph shows the first manned run of an Apollo emergency egress system. According to the NASA release, "three men...and six dummies rode it down" the slide wire. Opposite, Dr. William Pickering, Dr. James Van Allen and Dr. Wernher von Braun hoist a model of Explorer I after its successful 1958 launching.

significant historic resources of the late 20th century, it may well be that sites associated with man's first ventures into space, with the splitting of the atom, with the development of computers and artificial intelligence, or with the first successful products of genetic engineering, are the first examples that spring to mind.

Many of the sites and much of the equipment that facilitated modern scientific and technological development are still in active use; they stand as historic monuments to America's ability to invent and exploit technology and advance scientific and engineering knowledge. Other historic facilities, structures, and sites of comparable significance, however, are in danger of being lost to future generations. Deemed inactive or obsolete, used for purposes other than their original use, or "abandoned in place" under Federal property management rules, these historic properties suffer from neglect or inadequate maintenance. For example, Mount Wilson Observatory, a private institution on Angeles National Forest land that was built and operated by the Carnegie Institution of Washington, is now under the care of the Mount Wilson Institute. Unless fund-raising efforts are successful for its continued operation and use, it may be abandoned. At Cape Canaveral Air Force Station, Florida, adjacent to the Kennedy Space Center (KSC), a number of early launch complexes have been abandoned in place by the Air Force and most of their salvageable equipment removed.

The crucial difference between, for example, the Kennedy Space Center (KSC) at Cape Canaveral, Florida, a NASA facility, and Thomas A. Edison's laboratory at West Orange, New Jersey, part of the Edison National Historic Site managed and operated by NPS, is that KSC continues to function as a highly technical operational and research facility. Edison's workplace, conversely, is no longer used, although it has been preserved as a memorial to Edison's life and work. The same word, "active," describes most of the other sites under consideration. No one would reasonably argue that active facilities should have their research endeavors curtailed, that they should be thwarted in their continuing need to upgrade or that they should be turned into museums. It is, therefore, useful to examine briefly the basis for government support of science and technology before describing the Federal historic preservation program as it has evolved; both stem from post-World War II efforts to channel government support into two entirely different areas.

Federal support of science and technology

The Federal Government participates in scientific research in a variety of ways: through its own agencies using Federal employees and facilities, through contracts with private industry and public and private universities, and through making grants to individuals and academic institutions for research. Two key pieces of legislation establishing basic Federal programs were the National Science Foundation Act of 1950 (42 U.S.C. 1861-1875), which established NSF, and the National Aeronautics and Space Act of 1958 (42 U.S.C. 2451 et seq.) which, along with the original National Advisory Committee on Aeronautics (NACA), laid the foundation for NASA.

The National Science Foundation Act of 1950, inspired by Vannevar Bush's landmark work, *Science: The Endless Frontier* (1945), formalized a series of informal arrangements and individual government contracts into an institutionalized, regularly funded program of indirect governmental support for scientific and engineering research and education.
Authority for direct support of scientific and technical research and development programs has also been delegated to individual Federal agencies under a variety of programs since World War II. As these internal programs have developed, Federal agencies actively engaged in scientific research and development have come to rely on a combination of both in-house and contract personnel. Both approaches are employed, for example, by NASA, by the National Oceanic and Atmospheric Administration (NOAA) and the National Institute of Standards and Technology (NIST) of the Department of Commerce (DOC), by the National Institutes of Health (NIH) of the Department of Health and Human Services (HHS), by various branches of the Departments of Agriculture (USDA), Defense (DOD), Energy (DOE), and the Interior (DOI). However, NSF remains the major Federal agency providing indirect support for nondefense scientific research, either through grants or contracts.

Many academic and scientific research institutions also join with one or more Federal agencies to operate what are generally known as Federally Funded Research and Development Centers (FFRDC). FFRDCs include such institutions as the Jet Propulsion Laboratory at Cal-Tech (NASA), and the Lawrence Livermore National Laboratory at the University of California (DOE). With a combination of contracted services and grant support operated by university consortia, NSF supports a number of National Astronomy Centers. Additionally, NSF awards grants in support of Science and Technology Research Centers (STCs) at universities; the first eleven grants were made in Fiscal Year 1989. NSF created the Science and Technology Research Centers Program:

> to promote basic research that can most effectively be accomplished through centers--complex research problems that are large-scale, of long duration, and that may require special facilities or collaborative relationships across scientific and engineering disciplines.[5]

In cases where the Federal Government is physically engaged in scientific research at federally owned installations, the Federal role and interests are much clearer and more easily defined than in those cases where the Federal Government is involved in the conduct of research only through financial assistance. However, public policy concerns that underlie research support remain clear and were articulated by Erich Bloch, NSF's most recent former director, on the occasion of the foundation's 40th anniversary:

> ..[I]n keeping with major changes in global politics and international markets, the rationale for supporting science and engineering research and education has been changing. As political conflict among the great powers diminishes, the major arena for world competition will be economics. In the new global economy, which runs on new ideas and innovation, knowledge has become the critical resource, and basic research in science and engineering has assumed a vital importance to the economy and to the primary objectives and concerns of industry.

The Federal historic preservation program

After World War II, the United States embarked on an ambitious program of economic development. By the mid-1960s, however, it became apparent that a variety of domestic development initiatives had important social, cultural, and aesthetic costs. Historic buildings and neighborhoods that were treasured in their communities and definitive of local heritage and character, for example, were being lost to make way for new projects. The construction of superhighways destroyed a significant number of historic landscapes, neighborhoods, buildings and archeological sites. Reservoirs flooded the archeological remains of entire prehistoric cultures.

Congress passed the National Historic Preservation Act (NHPA) in 1966, to ensure that these costs were considered as economic growth continued. This act set forth the provisions and philosophy of the Federal historic preservation program and is the cornerstone of America's preservation program today. In the act, Congress declared that the Federal Government would:

- *foster productive harmony between modern society and historic resources;*
- *provide preservation leadership;*
- *administer historic resources in a spirit of stewardship;*
- *encourage preservation of nonfederally owned historic resources;*
- *encourage preservation and use of the historic built environment; and*
- *assist State and local governments and the National Trust for Historic Preservation in historic preservation activities.*

5 **NSF Science and Technology Research Centers**, 1989, page 1.

Yerkes Observatory, a federally supported research facility

The Yerkes Observatory in Williams Bay, Wisconsin, which is associated with the University of Chicago, provides a good example of how a research facility within a private academic institution operates with Federal support.

The University's department of astronomy and astrophysics is housed jointly in the Astronomy and Astrophysics Center on the Chicago campus and at the observatory. There is no administrative distinction between the two locations: the director reports to the department chairman; resources are allocated between the Astronomy and Astrophysics Center and Yerkes according to a joint review of what is in the best interests of the university. The campus facility houses the formal academic program and administrative staff. Some laboratory work, e.g., instrument construction, is conducted on campus. In contrast, Yerkes Observatory provides no formal academic courses but does provide facilities for undergraduate and graduate instruction in experimental and observational work.

Yerkes Observatory is the principal location for technical efforts, specifically detector development for observations at visual, infrared, and submillimeter wavelengths. Instruments constructed at Yerkes are used on a wide variety of telescopes and other instruments at many locations. Staff members are assigned to one or the other of the two departmental locations according to their respective activities. During the summer of 1990, there were 34 personnel in residence at the observatory, including four full-time faculty.

The nonemeritus faculty at Yerkes all have NASA and/or NSF grants which support their research efforts. Some of these grants directly support the development of new instruments, using the technical facilities at the observatory. At least one faculty member on the Chicago campus routinely uses the Yerkes facilities for this purpose; it is expected that a new faculty member on campus will do so as well. Other federally funded programs use the telescopes at Yerkes without necessarily requiring the development of new instruments. Still other federally funded programs are headquartered at Yerkes but involve data collection at other sites.

The maintenance of the Yerkes Observatory building and its grounds and associated staff and student housing is the responsibility of the university's physical plant department. The department of astronomy and astrophysics supports research and teaching activities, including telescope maintenance. In this way, support from the two separate departments is complementary.

In addition, the university library system supports a branch library with one part-time employee who maintains an archive of historical materials. Visiting scholars requesting access to the archives are provided staff assistance.

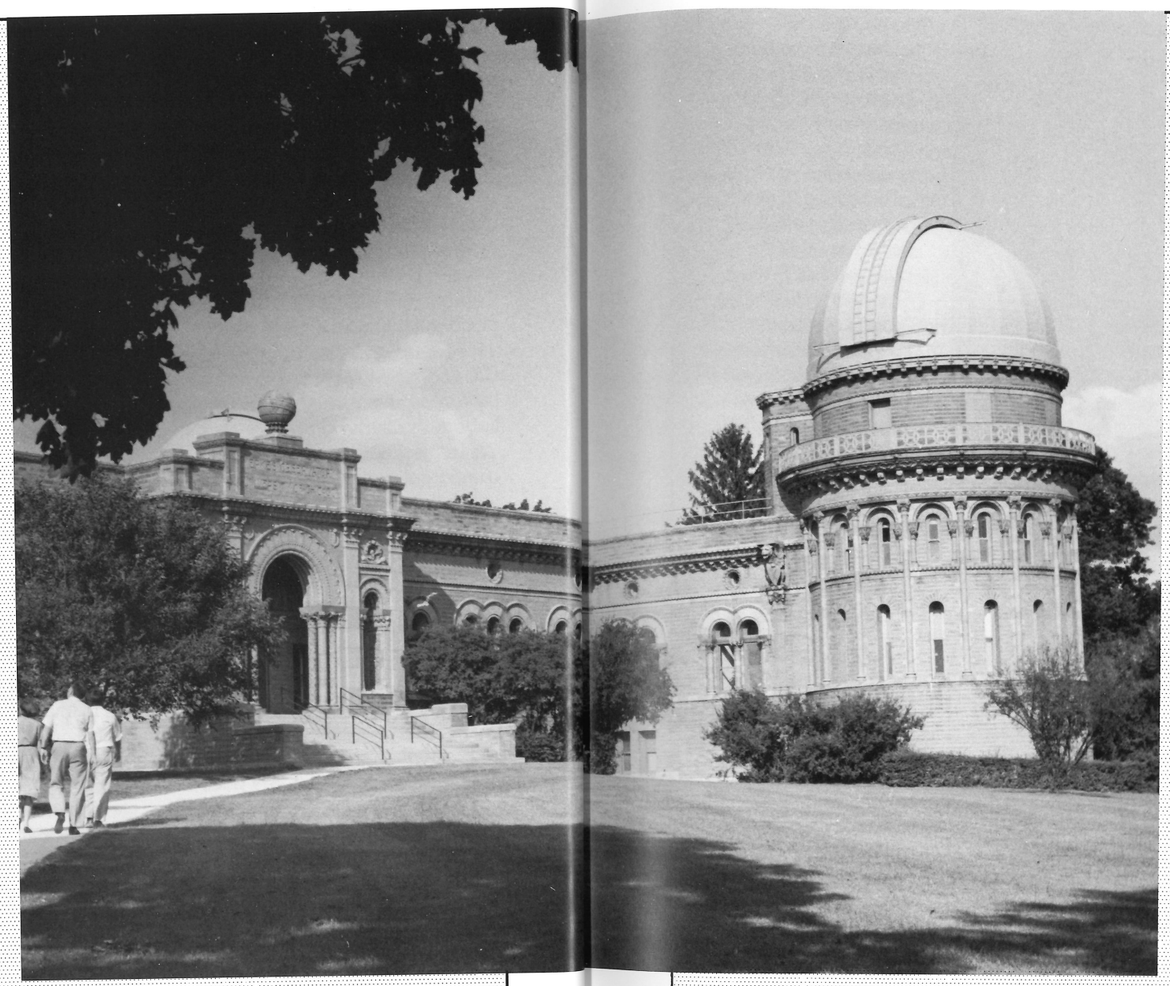
The following are primary research facilities at the observatory:

- *telescopes to facilitate research and instrument testing, and undergraduate and graduate instruction.*
- *computers, work stations, and peripherals*
- *electronics and mechanical shops*
- *graphic arts, including photography and drafting*
- *library and archives*
- *photographic plate vault*

Observatory activities in general are supported by grants. There are some categories, however, for which grant support is not available, e.g., telescope maintenance; in these instances the department of astronomy and astrophysics provides support.

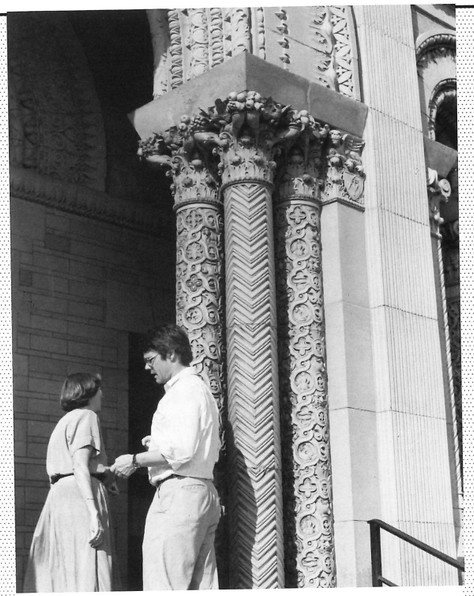
Yerkes Observatory affords not only the astronomy and astrophysics department but the University of Chicago as a whole the opportunity to participate in a number of major national collaborative research efforts. These currently include:

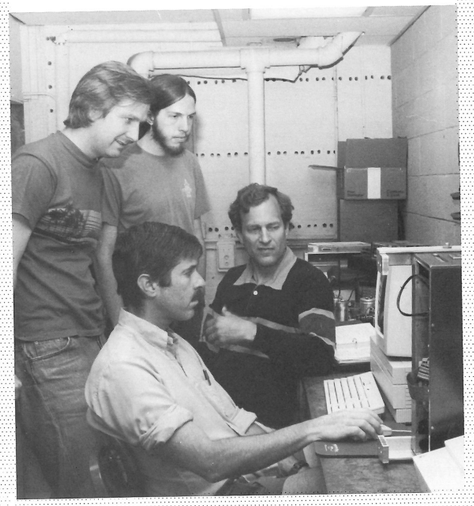
- *The construction of the 3.5 meter telescope of the Astrophysical Research Consortium, nearing completion at Apache Point, New Mexico. Members of the consortium include the University of Chicago, the University of Washington, Princeton University, New Mexico State University, and Washington State University. Approximately 40 percent of the project has been funded by NSF; the remaining funds were derived from participating institutions. Yerkes Observatory's contribution to this particular project has involved the design and construction of all but one of the many and varied instruments in addition to the design and construction of the guider/rotator system and much of the control software, including specifically the software for remote operation of the New Mexico observatory. Some of this operation has been conducted from the university campus using telescopes at Yerkes Observatory. Once the New Mexico*



telescope is operative, Yerkes will serve as one of the sites for remote operation.

- *Plans are now well developed by a consortium including the University of Chicago to build a 2.5 meter special-purpose telescope at the same site in New Mexico for the "Map of the Universe" project. This project is expected to be funded through a combination of Federal and other resources. The facilities at Yerkes would play an active role.*
- *With support from NASA Yerkes has been a primary participant in the ongoing development and operation of the Kuiper Airborne Observatory. Instruments developed at Rice University in Houston, Texas, and Yerkes Observatory are flown high altitudes in a modified C-141 cargo plane based at NASA's Ames Research Center, Moffett Field, near Santa Clara, California. Telescopes and other instruments utilized in the project have, for the most part, been constructed at Yerkes.*
- *As an outgrowth of the Kuiper Airborne Observatory project, a proposal is pending with NSF's STC program to establish an observatory at the South Pole. The STC is again a cooperative effort by a group of separate institutions but it would be headquartered at Yerkes. The center would feature a public outreach program designed to take advantage of the facilities of George Williams College, which adjoins Yerkes Observatory.*





Yerkes Observatory, associated with the University of Chicago, is operated in part with Federal support. The campus, which provides research and instructional facilities in the astronomical sciences, contains many architecturally significant buildings.

Two particular sections of the act are relevant to this analysis. Section 106, as amended, requires Federal agencies to take into account effects of undertakings on historic properties and afford the Council reasonable opportunity to comment on such undertakings. Section 110 of the act sets forth general agency program responsibilities for historic property management and establishes standards by which the adequacy of an agency's efforts to take effects into account may be judged. Section 106 however, contains the key Federal agency "compliance" responsibility; the statute and its implementing regulations delimit what is generally referred to as the "Section 106 process."

Section 106

The Council's role in the review of Federal, federally assisted, and federally licensed or permitted actions under Section 106 is to encourage agencies to examine alternatives to potentially destructive actions and, where feasible, to adopt measures that will preserve historic properties that would otherwise be damaged or destroyed. The Council has neither veto power nor authority to compel agencies to alter actions which will affect historic properties. Council regulations implementing the act, however, emphasize consultation between the responsible Federal agency, the governor's representative of the State's interests in the Federal preservation program (the SHPO), the Council, and other interested persons. This consultation is intended to lead ultimately to agreement about how agency goals can be balanced with the protection of the historic properties at issue. Regulations thus do not specify an outcome but ordain a process for creative conflict resolution.

The Council's regulations, "Protection of Historic Properties" [36 CFR 800] implement the several principal steps of the Section 106 process.

Step one in the Section 106 process requires Federal agencies to identify and evaluate historic properties that may be affected by a project. For purposes of 106 review, historic properties are those that are eligible for, or listed on, the National Register of Historic Places; properties may have historic significance at the national, State, or local level. National Historic Landmarks, a special category of nationally significant properties, must be formally recommended for NHL designation by NPS professional staff and the NPS advisory board; the Secretary of the Interior ultimately designates the NHLs.

The second step in the 106 review process requires the agency, in consultation with the SHPO, to determine what effect the project under consideration may have on historic properties.

If the effect will be adverse, step three requires the agency to consult with the relevant SHPO and in many cases, the Council, to attempt to avoid, minimize, or mitigate the adverse effect.

The fourth step involves Council comment on the undertaking. Council comment usually takes the form of a review of the preceding steps and the subsequent execution of a Memorandum of Agreement (MOA); if an agreement is not reached, advisory comments are rendered by the Council. The Federal agency then either carries out the agreement or considers the comments and proceeds with its project. Council regulations specify time limits for both SHPO review and Council action.

Council regulations also provide means through which agencies can fulfill their historic preservation obligations for a particular program, project, or class of undertakings that would otherwise require numerous requests for comments. Programmatic Agreements (PAs) set forth specially tailored agency procedures for the Section 106 process and are intended to serve as a cost-effective mechanism for discharging agency obligations. PAs often have the result of improving internal agency historic preservation review procedures. The Council encourages agencies to consider whether PA(s) for those activities that typically affect historic properties should be developed.[6]

6 Currently, the Council has a PA with NASA for management of their NHL properties. The Council is working with NSF, NCSHPO, and affected academic institutions on ways to address NSF's historic preservation responsibilities for all of its grant programs.

Section 110

Section 106 of the NHPA is a specific, issue-related mandate to which Federal agencies must adhere. Section 110, in contrast, sets out the broad affirmative Federal agency responsibilities with respect to historic properties. The aim of Section 110 is to integrate an ongoing consideration of the values of historic properties into Federal agencies' projects and programs. Specific subsections of NHPA relevant to this analysis including mandates that Federal agencies must:

- *assume responsibility for the preservation of historic properties under their jurisdiction, and should utilize where feasible historic properties available to them [§ 110(a)(1)];*
- *establish programs for identification and evaluation of their historic properties, and nominate those found to be historic to the National Register [§ 110(a)(2)];*
- *make records, to applicable professional standards, of their historic properties that must be damaged or destroyed so that there will be a permanent, archived record of their existence [§ 110(b)];*
- *designate a Federal Historic Preservation Officer who coordinates that agency's preservation activities under the NHPA [§ 110(c)];*
- *carry out their missions in a manner consistent with the intents and purposes of the NHPA [§ 110(d)];*
- *request, if desired, the Secretary of the Interior to review plans for the use of surplus federally owned historic properties when transferred from Federal jurisdiction [§ 110(e)];*
- *undertake such planning and actions as may be necessary to minimize harm to National Historic Landmarks [§ 110(f)].*

In fulfilling these responsibilities the Federal agency may, if desired, write off the costs of preservation-related activities as eligible project and program costs under Section 110(g). Federal agencies can meet their Section 106 obligations to "take into account" the effects of their undertakings on historic properties through implementing the provisions of Section 110 and the Council's regulations [36 CFR Part 800]. To assist agencies in better integrating a concern with historic preservation into their missions and activities, the Council and NPS have jointly issued a publication entitled *The Section 110 Guidelines: Annotated Guidelines for Federal Agency Responsibilities under Section 110 of the National Historic Preservation Act* (1989). The publication includes detailed discussions of the subsections of Section 110, setting forth requirements subsection-by-subsection, their applicability and the kinds of positive actions agencies need to take to comply with them. The principles and approaches set forth in the guidelines have been approved by the Council for Federal agency use in meeting responsibilities under Section 106. The Council also uses the Section 110 guidelines as the basic standard against which to measure the adequacy of agency programs when the Council conducts program reviews under the authority of Section 202(a)(6) of the act.

The guidelines are intended to be used in conjunction with another NPS publication entitled *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716-44740, 1983), which includes standards for preservation planning; the identification, evaluation, and registration of historic properties; the documentation of historical, architectural, engineering, and archeological resources; the management of historic preservation projects; and the desirable professional qualifications for participants in a given project. References to additional technical information are also provided.

Juxtaposition: public policy and the Federal Government's stewardship role

In summary, the Federal historic preservation program, especially Sections 106 and 110 of NHPA, is designed to give the Federal Government a leadership role in the stewardship of historic properties. At times, this public policy may come into conflict with other policies supporting basic research as well as engineering development activities. This report asks how can organizations, whose primary missions are active research and highly technical operations, also perform their public stewardship role for the nation's historic resources, given the need to continually

modify or replace "historic" facilities and equipment? Who will pay for "mitigation" measures?

Concerns about maintaining the ability to rapidly adapt to changing technologies lie at the heart of the ambivalence with which engineers, scientists, and site managers, among others, view historic preservation at technical facilities and research laboratories. Given the complex nature of Federal support for many institutions, how can a historic preservation "review" process that falls outside of existing scientific or management decisionmaking be imposed?

Some worry that necessary compliance with Federal historic preservation statutes could impede the ability of American science and technology to stay at the forefront of international research and achievement. As functional and active facilities, NASA's test and development sites, DOE nuclear research laboratories, and DOD military hardware research centers continually need to replace and upgrade equipment if they are to stay at the cutting edge of their respective missions. But the Federal agencies managing or assisting these facilities also have a responsibility to present and future generations to consider the effects of their actions on the historic values embodied therein. Clearly some balancing must be done. As recognized in the FY 1991 Federal budget:

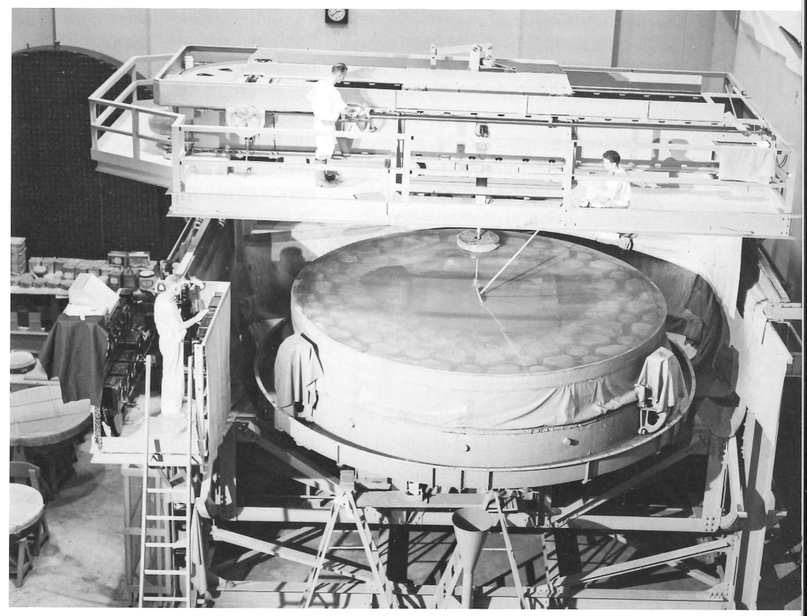
> One might ask what "preserving America's cultural heritage" may have to do with investing in America's future. To many the connection is not obvious. But the connection is important nonetheless. To the extent that investing in the future tends to emphasize technological advances--as it should--there is a need to assure a counterbalancing attention to aesthetic values. To the extent that it implies a race through time, there is a need for a balancing appreciation of history. And to the extent that America's traditional cultural values have helped make America uniquely strong, it is important that these values be preserved--in order that they may be built upon as America continues to advance (*Budget of the United States, Fiscal Year 1991*, January 1990, page 165).

The remainder of this study explores how that consideration can best take place, given the necessary primacy of scientific and technological advancement.

CHAPTER 3:

Areas of tension between scientific research/technological facility operation and the Federal historic preservation program

This chapter identifies and discusses this study's five principal issues.



Some argue that important scientific facilities are as worthy of preservation as battlefields or houses. Others counter that the "historic" component of scientific facilities is far more narrow. At left is an aerial view of the Mount Wilson observatory complex; above, technicians polish the 200-inch lens--some would say the most historic component--of Mount Palomar's Hale telescope.

The Issues

☐ **What is special about scientific facilities and research/technology programs? Should they be treated differently from other Federal activities for purposes of historic preservation?**

Many members of the historic preservation community argue that scientific and technological research programs should be handled no differently than other national priorities, such as economic development, transportation, affordable housing, infrastructure maintenance, or rural development. In general, projects and programs designed to advance national goals must comply with the National Historic Preservation Act and other similar environmental statutes. Such requirements ensure consideration of historic values in project planning or Federal assistance decisions but leave the final determination up to the Federal agency so long as it has "taken into account" the consequences of its actions on historic properties. Preservationists assert that scientific and technological research programs and facilities should be treated the same way as other recipients of Federal assistance.

Many preservationists view historical manifestations of scientific or technological achievements, including both equipment and physical facilities, as equally as worthy of preservation as more ubiquitous reminders of the past, such as houses, battlefields, and archeological sites. Each facility or piece of equipment, they argue, illustrates a specific moment in America's historical development; these vestiges of scientific advancement, therefore, deserve preservation consideration at least.

On the other hand, members of the scientific community

make a distinction between scientific advancements themselves, and the facilities and equipment used to achieve them. In this context, what is historically important about placing men on the moon may well be that the United States found this goal worthy of pursuit. Excellent examples of the technological achievements that grew out of that commitment, such as the Saturn V launch vehicle, the Lunar Rover, and Lunar Module, are already in museums. Some argue that this material, in combination with contemporary films, written histories, and astronauts' equipment, adequately illustrates modern scientific achievements.

In this view, the basic--although sometimes unique--equipment or specialized facilities that played a role in hardware design, construction, and perfection are merely tools used to produce the final product--scientists' and engineers' "hammers," one facilities manager explained. It could be argued, therefore, that such facilities are not inherently historically valuable. No one at NASA, for example, would argue that the Apollo spacecraft or its predecessors, the Mercury and Gemini capsules, are not prime examples of American engineering excellence and should be preserved. The launch sites and testing equipment used to support the missions, however, merely facilitated the spacecrafts' ultimate and successful use and are not in themselves valuable. In the field of astronomy, scientists assert that what is most important are knowledge gains that have been made, not the equipment used to gather new information. They believe that Palomar's 48-inch Oschin Telescope is significant for its ability, for example, to view large areas of the sky and contribute to more accurate sky surveys; if the telescope has any significance, its significance derives solely from its engineering and optical qualities. Certainly astronomers appreciate the technical means of facilitating scientific advancements, and would be the first to honor the historic telescopes involved. Still, they assert that the essence of an optical telescope is its mirror and/or lenses. The most important part of the instrument can neither be seen nor appreciated by looking at the exterior of the telescope in question.

This question of what historic significance these scientific tools may possess apart from their very real contributions to scientific progress is an important one which lies at the heart of disagreements between many scientists and preservationists. Clearly, why an object or facility is considered to be historically important, and to whom, will need to be developed before the apparent conflict between scientific advancement and preservation of America's scientific past can be resolved.

☐ Who is the preservation audience? Who benefits from the preservation of historic and scientific and technical resources?

Another way of raising this question is to ask, "Why preserve?" In the preamble to NHPA, Congress declares that "the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people." The act continues to affirm that "the preservation of this irreplaceable heritage is in the public interest so that its vital legacy of cultural, educational, aesthetic, inspirational, economic, and energy benefits will be maintained and enriched for future generations of Americans."

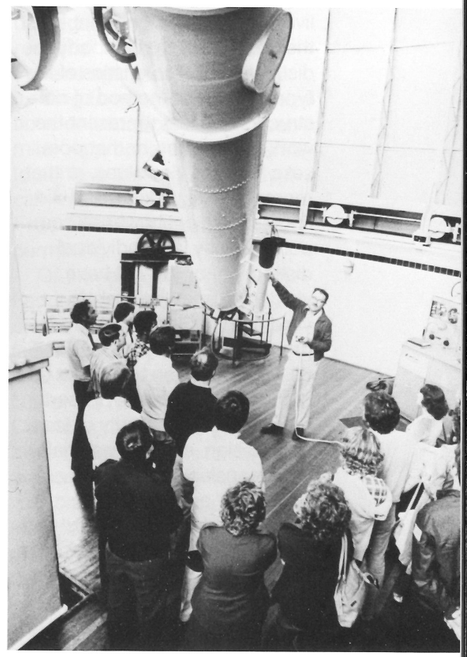
Who benefits, or should benefit, from such a policy and in what ways? Certainly public education and inspiration are factors here; additional motivation for preservation lies in its public relations value. Any discussion of ways in which public understanding of highly scientific research can be enhanced must make distinctions between the casual museum visitor, the beginning student, and the more serious scholar of science and technology. The casual visitor, one curator remarked, may be interested enough in the subject to go to a museum, but he or she also wants to be entertained. Interactive displays which provide the opportunity to touch actual hardware associated with an historically significant project are aimed at this group. If these visitors can leave the museum feeling that they have learned something, so much the better.

These factors come into play in presentations to school students as well. The scholarly or avocational museum visitor, on the other hand, tends to want more detailed information than is often available on the display placard. Preservation of actual hardware is only one facet of a given project's interest.

The distinction between the casual museum-goer and the more serious student of science and technology deserves careful attention. At the Smithsonian's National Air and Space Museum, for example, a well-stocked bookstore complements displays of aircraft and space-related objects. Bookstore material ranges from age-specific general interest publications, to detailed discussions of specific aircraft and manufactures, to sophisticated treatments of various space projects and programs. Videotapes illuminating the history of aeronautics and spaceflight are also available for purchase. In exhibitions themselves, there are clear differences between the walk-through mockup of the SkyLab space station, popular with both children and adults, and the highly technical interactive exhibit on the use of computers in aeronautical design, flight testing, and aircraft operation called "Beyond the Limits: Flight Enters the Computer Age." Similar audience distinctions are made at the Alabama Space and Rocket Center in Huntsville, Alabama, which also serves as the museum and interpretive center for NASA's Marshall Space Flight Center. Not only can visitors view technical exhibits on Marshall's role in aerospace research and development but also ride in the "Spacewalker" to get a brief feeling of weightlessness. At the U.S. Naval Observatory, open-house evenings every Monday include a technical tour and opportunities to look through the 26-inch refracting telescope used in the 1877 discovery of the moons of Mars. Yerkes Observatory holds similar open house tours each week.

NPS fully considered the role of museums in their decisions which led to the Secretary of the Interior's designation of nationally significant properties in the "Man in Space" program. Museums have preserved one part of the story. Nevertheless, testing facilities and hardware that would likely be of less interest to the casual museum-goer, e.g., the Spacecraft Magnetic Test Facility at Goddard Space Flight Center, the 25-Foot Space Simulator at the Jet Propulsion Laboratory, or the Variable Density Tunnel at Langley Research Center were still designated. It is the Council's perception, therefore, that with "Man in Space" at any rate, historic preservation has tried to address the needs of both the casual museum-goer and the serious student of space sciences. Obviously, problems occur when much of the historically scientific work remains classified for national security reasons, such as much of the early research toward the atomic bomb conducted at Los Alamos.

The distinction between the museum visitor and the scholar of science and technology also has important implications with regard to the "preservation" of history. The retention of components of America's scientific past and the kinds of measures various facilities might pursue to balance their mission needs with preservation depend in large part on public interest in that past. To what lengths should Federal agencies go to preserve physical sites and to make available detailed information on the history of agency missions and programs? Is it in the public interest to spend funds on maintenance, interpretive materials, historians, archivists, and additional visitor facilities to ensure that all may visit and have access to appropriate information? To what lengths should an agency go to preserve the physical hardware that played a part, however technical, in a nationally significant event? The recommendations contained in the last chapter examine the range of the preservation public to suggest a variety of ways through which agencies could better preserve and present America's collective scientific heritage.



The U.S. Naval Observatory offers public tours, which include a look through the telescope used to discover the moons of Mars in 1877.

☐ **What is the nature and significance of the affected historic resources? Why are they important, and how should they relate to the evaluation criteria and process established under historic preservation statutes?**

The criteria for evaluation of a potentially historic property as promulgated by NPS for the National Register of Historic Places identifies four complementary types of significance. Properties: (a) that are associated with events that have made a significant contribution to the broad patterns of history; or (b) that are associated with the lives of persons significant in the past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history [36 CFR § 60.4]. In addition to at least one of these qualities, the property must "possess integrity of location, design, setting, materials, workmanship, feeling, and association," as relevant. That is, there must be sufficient historic material or sense of historic context for a visitor to appreciate as historic.

Within this general framework, scientific and technical resources with historic value would generally fall under one or more of the first three criteria. Potentially historic resources that could be affected by Federal scientific research operations include:

- *Sites publicly associated with major scientific advances or technologically significant events, e.g., the Mission Operations Control Center at Johnson Space Center near Houston Texas; the Los Alamos National Laboratory in Los Alamos, New Mexico; Rogers Dry Lake at Edwards Air Force Base, California;*
- *Equipment and facilities used to make significant advances in science and technology, e.g., the Saturn V Dynamic Test Stand at Marshall Space Flight Center in Huntsville, Alabama; the full-scale wind tunnel at Langley Research Center, Hampton, Virginia;*
- *Rare or unique examples of historically significant technology itself, e.g., the Hale 200-Inch Telescope at Palomar Observatory in San Diego County, California; the Experimental Breeder Reactor No. 1 near Arco, Idaho; and*
- *Architecturally significant laboratory buildings and facilities where research was carried out, e.g., Yerkes Observatory; U.S. Naval Observatory buildings.*

While many of the more visible historic facilities and pieces of significant equipment are owned by various Federal departments or agencies, it is likely that the majority of such facilities, including buildings, engineering structures, and scientific equipment, are in non-Federal hands. Historic achievements are linked to private research institutions, State universities, and companies engaged in research and development work. Thus, it is difficult to judge the universe of historic facilities that are still extant, have had relatively few modifications to their historic features, and are worthy of study and recognition.

Scientific and technical resources achieve historic significance for a number of reasons. The U.S. Naval Observatory, above, is architecturally significant. Launch Pad 5/6 at Cape Canaveral is a site associated with major technological advances: the first manned space flight was made from here in 1961. The pad now is part of the Air Force Space Museum, which preserves many important remnants of the space age for public benefit.

It is clear, however, that several key issues arise from what is known about the kinds of science and technology facilities that may be historic. These issues must be considered carefully in any future evaluations of significance. Areas that will require examination include:

- *the age of the facility or its equipment (the normal age for initial consideration for inclusion to the National Register of Historic Places is 50 years, although there are exceptions to that rule);*
- *the representativeness of the facility, structure, or object when compared to other similar properties, versus its uniqueness (virtually all of the "Man in Space" and "Astronomy and Astrophysics" facilities considered as NHLs are one-of-a-kind);*
- *the "integrity" of the resource, given the continuing alterations that have taken place at such facilities, in terms of continuity of function and the amount of original historic fabric, material, or equipment still extant; and*
- *the conduct of the evaluation, including the qualifications of the evaluator and persons consulted during the evaluation.*

☐ **What are the possible problems and misconceptions in historic preservation review of scientific and technical facilities? Is there resistance by scientists and facilities managers to comply with existing Federal historic preservation law and procedures, and if so, why? Could existing procedures be improved or better implemented?**

It is the responsibility of the Federal agency to identify and evaluate historic properties under its jurisdiction and to take reasonable steps to ensure that they are not inadvertently lost, damaged, or destroyed. This responsibility also extends to Federal agencies that provide funding to non-Federal organizations or issue licenses and permits. Appropriate mechanisms to achieve these goals are typically made conditions of Federal funding, licensing, or permitting.

Of primary concern to both Federal agencies and privately owned scientific and technical facilities is the possibility that their compliance with Section 106 of the NHPA and the Council's regulations might impede national efforts to stay at the forefront of scientific advancement. Impediments might include excessive delay through plan review, the forced modification or "veto" of plans for new facilities as a result of a lack of understanding of the scientific issues or equipment involved, and/or an injection of politics into the scientific decisionmaking process, e.g., State or local government becoming involved,

or the provision of a public forum for research decisions.

Scientific organizations fear that the preservation community does not fully appreciate that new technologies and ways of capitalizing on them depend upon state-of-the-art laboratory equipment. When space and money is at a premium, this often results in the removal and excessing of obsolete equipment. It can also mean modifications to the facility and its equipment which can, over time, compromise the historical "integrity."

It may be that this apprehension emanates from a lack of understanding by the scientific community of the Federal historic preservation review process. There is, however, a similar ignorance of the workings of scientific facilities on the part of the preservationists. The concern that the SHPO, Council, and NPS staff may not be able to make informed, timely judgments on the historical significance of scientific equipment and facilities and assess effects of specific projects on them has some validity based on previous experience. Facilities managers' worst fears would be confirmed the first time an objection is made on the basis of "lack of information" concerning either the historic significance of a property or the effects of a proposed modification to that property.

As previously discussed, most scientific equipment is not viewed as a candidate for preservation in the standard historic preservation sense. Consequently, most scientists would argue that the need to replace, modify, or remove research equipment as necessary should take precedence over historic preservation considerations. Scientists also emphasize that the best way to "preserve" such facilities is to continue to use them; this decision justifies an otherwise insupportable continuing maintenance commitment.

The vast majority of Federal funds for scientific research is used to acquire state-of-the-art and more basic equipment, in addition to purchasing computer time and paying staff salaries. Most scientific research that receives Federal funding, therefore, is unlikely to affect historic properties through destroying or altering their historic characteristics. A small minority of such activities, however, does have that potential, and must be carefully considered.

☐ **What are possible ways to enhance the public's understanding of historic scientific and technological properties, and the most appropriate measures to mitigate the effects of development or modification? Where does the public interest lie in the preservation and interpretation of historic scientific and technological resources, and what special interest groups or other constituencies have interests in such decisions beyond the scientists and other researchers using such facilities?**

Who will benefit from the retention of the vestiges of America's scientific and technological past that go beyond museum exhibits and written histories? Is it enough to see an interpretive display about the development of the atomic bomb? Would the opportunity to view an actual 1950s nuclear reactor control room or the workspaces where Fat Man and Little Boy were assembled enhance public understanding of this complicated period in American history? At what cost should the public be provided the chance to experience directly the physical manifestations of America's scientific and technological heritage?

Many pathbreaking instruments and scientific facilities remain in use; it is by their continued long-term use, in fact, that they have become a part of America's heritage. To the extent that they continue to function in their original scientific research role, they stand as living historic monuments to America's ability to invent technology and advance knowledge. Yet public interest in the history of science and technology continues to rise. Approximately three million people visited Kennedy Space Center in 1989. The Smithsonian's National Air and Space Museum, the most popular of all Smithsonian museums, continues to break attendance records; annual totals exceed 7.4 million. Clearly Americans welcome opportunities to learn more about these aspects of their national heritage. In addition, the potential of such places to inspire future generations to science should not be underestimated.

Council staff visits to various scientific facilities to gather information for this study determined that 1) virtually all facilities have some sort of "public awareness" program or small visitor facility;

and 2) there is a variety of ways in which these facilities convey their respective achievements to the public.

Many of NASA's installations, the California Institute of Technology's Palomar Observatory, and DOE facilities such as the Los Alamos Laboratory and the Oak Ridge National Laboratory in Oak Ridge, Tennessee, have museums where the visitors can learn more about the agency and the research a given installation is conducting under its aegis. Under the provisions of the National Aeronautics and Space Act of 1958, NASA is charged with development of public education and outreach programs. Some of these museums and visitor centers are small and apparently underfunded; others, such as at Kennedy Space Center, which is operated as a concession contract for NASA by TW Services Inc., attract millions of visitors each year. Whatever their budget, these places typically contain exhibits involving excess or obsolete hardware from the installation itself; often exhibits are adjacent to exhibits prepared by contractors to show off their work. Many of these centers contain bookstores where visitors can obtain more detailed information on the project or program of interest.

In addition to museum retention of the more popular, visible, components of America's scientific heritage, are there other effective methods to convey this legacy? Are there any routine mitigation measures that an agency could employ to retain important historical information while allowing the agency to go forward with its mission? The following mitigation measures are used in many Section 106 projects by the Council, Federal agencies, and SHPOs where appropriate:

- *onsite interpretation of historic sites;*
- *compiling and archiving engineering drawings and diagrams;*
- *historic and modern photographic or other audiovisual documentation and archiving;*
- *increased support of visitor centers, museums, displays, tours, and other visitor experiences; and*
- *written popular and technical histories and other accounts.*

Questions concerning appropriate mitigation measures that need to be addressed include: Will implementation of mitigation measures "interfere" with the business of ongoing scientific research? Who is responsible for funding and implementing mitigation measures when a Federal agency grants research funds to a non-Federal research and development entity?

Summary

The principal issues identified by the Council during the conduct of this study may be grouped as follows:

☐ **General**

- *What are the unique characteristics of scientific facilities and research/technology programs?*
- *Who is the preservation audience?*

☐ **Identification and evaluation**

- *What is the nature and significance of the affected historic resources?*

☐ **Assessing effect and the consultation process**

- *What are possible problems and misconceptions in historic preservation review of scientific and technical facilities?*

☐ **Treatment and stewardship**

- *How can the public's understanding of historic scientific and technological properties be enhanced, and what are the most appropriate measures to mitigate the effects of development or modification?*

The first two general issues are explored throughout the remainder of this report; the last three are more specific and are analyzed in greater detail in chapters 4, 5, and 6. These issues provide clues to how conflicting values can be better balanced in the future. Each issue is addressed in summary form in this report's final chapter which also contains general conclusions and recommendations.

CHAPTER 4:

The historic significance of scientific and technological facilities

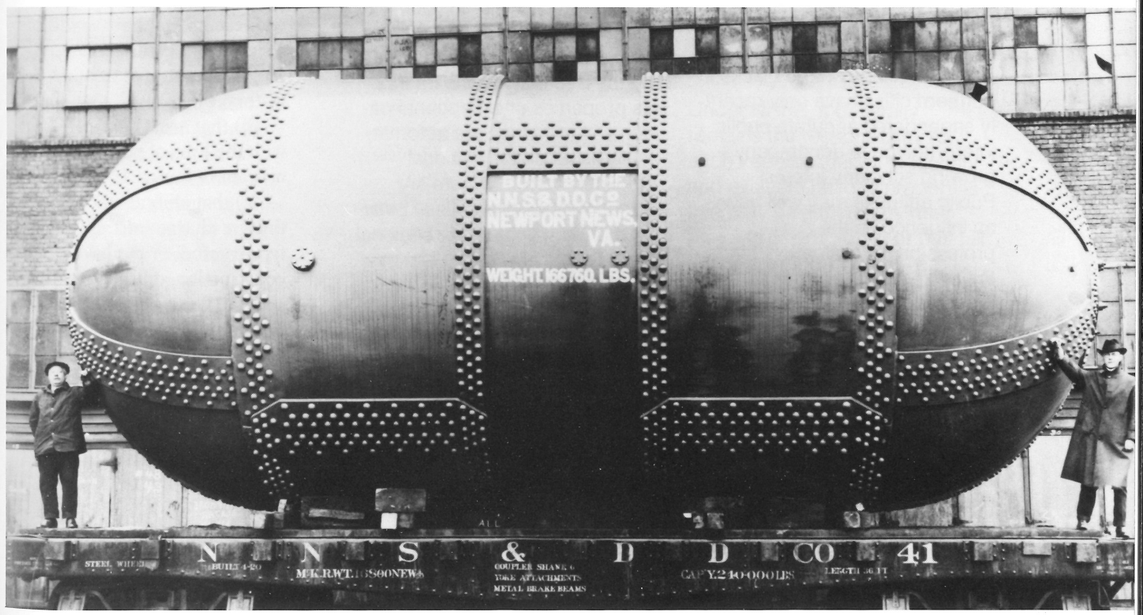
One key issue that figures prominently in discussions with agencies and affected institutions is exactly *what* is historic about their facilities and *who* should be making these determinations of significance. In theory, the Federal preservation program makes a distinction between what is considered historic and what should be preserved; however, in practice these distinctions often blur. Those making formal judgments of historic significance are not the only ones who have a stake in whether the property, object, structure, or facility can or will be preserved, much less how it can be preserved. The Federal preservation program enters into this picture here through 1) the NPS' NHL program, 2) the application of criteria for inclusion in the National Register of Historic Places, and 3) the process of identifying and evaluating properties that might be historically significant, in this case for their role in science and technology.

Why scientific and technological facilities are historically important: criteria of significance

Background

What makes a property historically significant? This question is not answered easily, especially in the case of scientific objects and facilities where specialized knowledge and a background in the history of

What makes a property historically significant? That question is not always easily answered. Below is an early photograph of a 1922 variable density wind tunnel, now a National Historic Landmark. Opposite is a transonic wind tunnel built in 1939 and renovated in 1990; to date, it has not been designated historic.



science and technology may be required. Subjective elements and judgments enter into any such evaluation. What events or discoveries were critical over the life of a scientific facility? What elements of the facility are imbued with "historic" value, and what are more recent alterations or modifications? Does a property's historic value derive from its *association* with events or persons, making physical historic fabric of secondary importance?

Opinions about historical significance, on the part of professionals and the general public alike, vary widely with the passage of time and changes in public attitudes toward our collective heritage. Public taste is notoriously capricious; so, too, is scholarly interest. For example, most people today find architectural and aesthetic value in Victorian buildings; 30 to 40 years ago this was not the case. The dependencies and slave quarters found on southern plantations and the 19th-century urban dwellings of free blacks in northern cities have only recently engendered accurate public interpretation to accompany growing scholarly interest. Public attitudes may well have an influence on the professional's evaluation, since the professional is, after all, a part of a broader social and cultural milieu.

It should be emphasized that the decision concerning what is *worthy* of consideration should be kept separate from the decision on what is *actually* to be preserved. Just because a property is deemed significant does not necessarily mean that it is inviolate; in Federal historic preservation program terms, this designation merely means that the property is worthy of consideration in planning and decisionmaking. However, there are practical problems with maintaining this distinction between evaluation and treatment, and these problems have become particularly evident in discussions of historically significant scientific and technical properties.

The National Register of Historic Places and National Historic Landmarks

For purposes of the Federal Government and Section 106 review, a "historic property" is one that is listed in or eligible for listing in the National Register of Historic Places. The Register is the nation's official list of historic resources; it includes over 52,000 buildings, sites, structures, districts, and objects. Additionally, all National Historic Landmarks (NHLs) designated by the Secretary of the Interior as properties of exceptional national significance are automatically listed on the National Register; currently there are 1,942 of these properties. Finally, there are units of the National Park System, including National Historic Sites, National Historical Parks, National Monuments, and other special places under the control or jurisdiction of the NPS, and these number some 350. These include units with both natural and historic resources, and the large natural resource parks also contain historic resources that must be managed.

A property is eligible for inclusion in the Register if it meets the National Register criteria. It is eligible to be *considered* for NHL designation if it meets specific NHL criteria.

National Register criteria provide the basis for evaluating the historic significance of properties. NPS, which maintains the National Register, is the final arbiter of whether given properties meet the National Register criteria. The National Register criteria are set forth at 36 CFR § 60.4 and state that:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) that are associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) that have yielded, or may be likely to yield, information important in prehistory or history.

The concept of integrity is critical to the application of these criteria. All qualified properties must meet one or more of the criteria and, additionally, must be judged to have "integrity." "Integrity" does not denote absolute purity, but it does demand enough physical presence to retain a "preservable entity" that communicates relevant significance.

While National Register-listed and -eligible properties can have three levels of significance--national, state, and local--all NHLs are *nationally significant* historic properties. This means that they are associated with events, or persons, or possess distinctive characteristics, or may be likely to yield information, that is exceptionally important for, and reflects significantly on, the nation as a whole. The NHL criteria are contained in 36 CFR Sec. 65.4, and state that:

> The quality of national significance is ascribed to districts, sites, buildings, structures and objects that possess exceptional value or quality in illustrating or interpreting the heritage of the United States in history, architecture, archeology, engineering and culture and that possess a high degree of integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> (1) That are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history and from which an understanding and appreciation of those patterns may be gained; or
>
> (2) That are associated importantly with the lives of persons nationally significant in the history of the United States; or
>
> (3) That represent some great idea or ideal of the American people; or
>
> (4) That embody the distinguishing characteristics of an architectural type specimen exceptionally valuable for the study of a period, style or method of construction, or that represent a significant, distinctive and exceptional entity whose components may lack individual distinction; or
>
> (5) That are composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture; or
>
> (6) That have yielded or may be likely to yield information of major scientific importance by revealing new cultures, or by shedding light upon periods of occupation over large areas of the United States. Such sites are those which have yielded, or which may reasonably be expected to yield, data affecting theories, concepts and ideas to a major degree.

The National Park System Advisory Board applies these criteria in reviewing nominations originating with SHPOs, Federal agencies, the National Park Service's History Division, or the private sector, and in preparing recommendations to the Secretary of the Interior. Studies leading to recommended designation, often encompassing a number of properties centered on a common theme, are prepared by historians, archeologists, anthropologists, and other preservation professionals familiar with the broad range of the nation's historic and prehistoric sites and themes. The criteria are intended to establish the qualitative framework in which comparative analysis of historic properties can fruitfully take place.

The process of identification and evaluation

Under NHPA, it generally remains the responsibility of each Federal agency to identify and evaluate historic properties that may be affected by their projects or programs, or that fall under their jurisdiction. The Council and NPS have jointly issued a booklet entitled *Identification of Historic Properties: A Decisionmaking Guide for Managers* to assist in the identification process.

The evaluation process is carried out in consultation with the relevant SHPO. If there is a disagreement as to whether a property meets the criteria, under Council regulations

documentation on the property must be forwarded to the Secretary of the Interior for a final determination.

An owner of private property may object to including his or her eligible property in the National Register and block it from being listed. Publicly-owned property, on the other hand, cannot be excluded from the Register. Effects on an eligible but unlisted property are not exempt from Section 106, however, since the property still *meets* the National Register criteria.

In order to determine which nationally significant historic properties should be NHLs, nominations are first prepared by, or under the supervision of, NPS. The study resulting in landmark designation for the properties associated with "Man in Space" was carried out as required under Section 18 of Public Law 96-344, enacted by Congress in 1980; those resulting in landmark designation and consideration for designation under the "Astronomy and Astrophysics" theme were carried out as part of the normal NPS process for conducting landmark theme studies. In either case, nominations for landmark status are then evaluated by the National Park System Advisory Board, comprised of NPS professionals, outside scholars, and interested private citizens. Properties that are recommended by the advisory board as deserving landmark status are presented to the Secretary of the Interior who makes the final decision and designation.

For purposes of compliance with Sections 106 and 110 of NHPA, one of the major shortcomings with the "Man in Space" and "Astronomy and Astrophysics" studies is that they focus on only selected properties considered to possess national significance. These studies are not, nor do they purport to be, comprehensive inventories of all properties that may be eligible for the National Register of Historic Places; the astronomy study is more complete than the space study on this point. By default, this narrows the focus of existing preservation discussions to those specific historic properties that have been studied and designated as NHLs. As noted above, Section 106 requires agencies to "take into account" the effects of their projects on all properties that qualify for inclusion in the National Register, and the NHL list is insufficient to meet this purpose.

Application of the criteria in practice

The historic significance of scientific and technological facilities

Most National Register and NHL criteria are met by the space program and astronomical research facilities under review here. Under the NHL criteria, which as we have discussed are essentially an elaboration of National Register criteria, these objects, structures, and facilities:

1) Are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history and from which an understanding and appreciation of those patterns may be gained [*e.g., going to the moon and back six times; America at the forefront of the development of new sciences and technology; our quest for space and astronomical knowledge*]; or

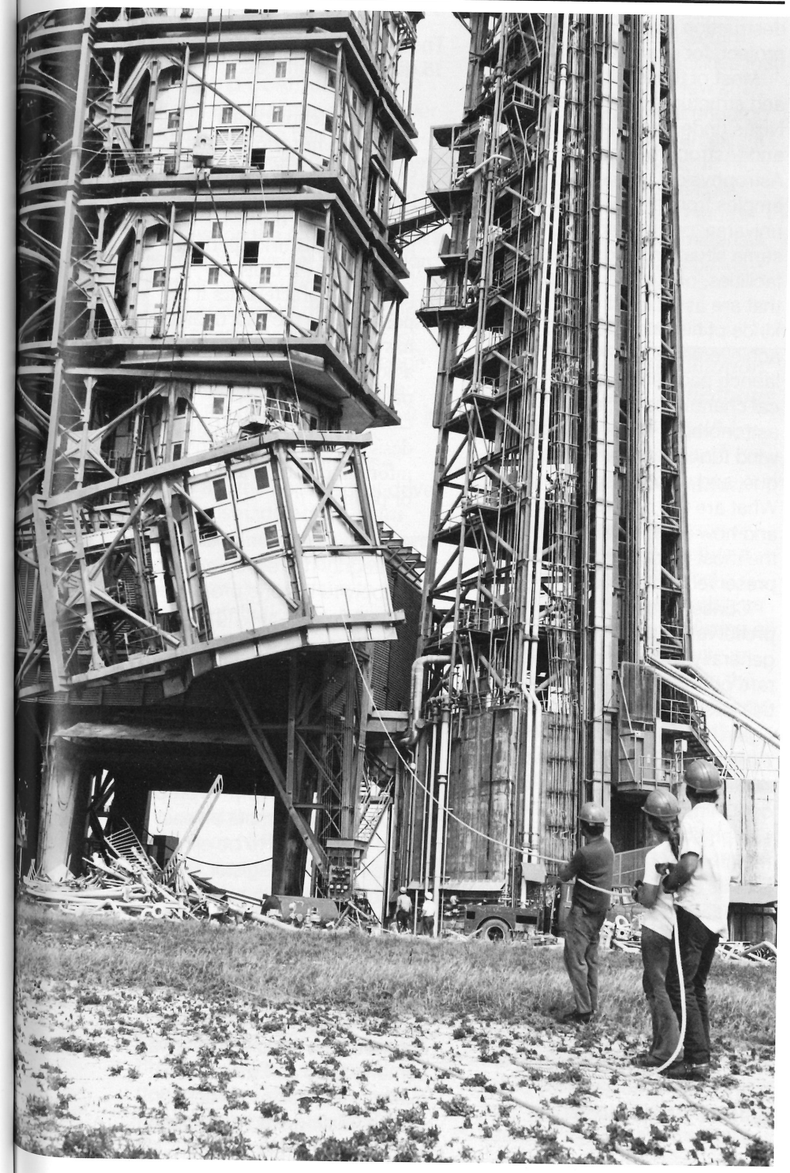
2) Are associated importantly with the lives of persons nationally significant in the history of the United States [*e.g., Robert Goddard, Werner von Braun, Alan Shepard, Neil Armstrong, George Ellery Hale, Percival Lowell*]; or

(3) Represent some great idea or ideal of the American people [*e.g., constant search for new horizons; the national will to send men to the moon; commitment of the resources to do it*]; or

(4) Embody the distinguishing characteristics of an architectural type specimen [*e.g., privately endowed scientific institutions of the late-19th and early-20th centuries*]; or

(5) Collectively compose an entity of exceptional historical or artistic significance [*e.g., World War II-era research and development laboratories*].

"Down with the old," this NASA photo caption says, describing a Saturn launch complex being dismantled. Scientific equipment is constantly being modified, or it is built for a specific purpose and dismantled when no longer needed. The physical equipment that played a part in a scientific breakthrough, then, may be long gone when the time comes to assess its scientific contribution.



The age of the facility or its equipment

The "normal" age for consideration for listing in the National Register and as a NHL is 50 years. This allows for an historical perspective on the property's significance: After the passage of at least 50 years, is the property, in fact, historic? Has it stood the "test of time"? While not a hard-and-fast rule, this cutoff is a convenient and useful method for culling the long list of properties that *may* be considered historic by some, from those that should be formally evaluated against the National Register criteria. Allowances can be made for properties less than fifty years of age that, by consensus, are recognized as significant. The main terminal at Washington's Dulles Airport designed by Eero Saarinen, for example, is less than fifty years old, but is recognized as an architectural masterpiece and is eligible for the Register.

While this age criterion may work well when considering potential historic significance of many scientific and technological facilities (including buildings and laboratories), its use can be problematical when considering equipment and structures used in the buildings and labs. The primary reason, as pointed out at several other places in this analysis, is that equipment is constantly being modified for new kinds of research, or is built for specific purposes and dismantled, cannibalized, or discarded after use. Thus the physical equipment that played a part in a scientific breakthrough may be long gone

when the time comes to assess its scientific contribution. Certain unique kinds of equipment and facilities, however, can prove useful for a very long time--the Hale telescope at Palomar is an excellent example. The actual 200-inch mirror would now meet the fifty year rule; the architecturally significant building housing it does not.

Representativeness versus the uniqueness of the facility, structure, or object

In theory considerations of the uniqueness of a property, whether it is "one of a kind," should not enter into decisions about whether or not a property is historic. It does not matter whether it is rare, relatively common, or ubiquitous in order to be considered significant for purposes of Section 106. Only at the time that evaluation gives way to consultation about what is to be done with the historic property should the number of extant examples be considered in reaching a decision about its future. In practice, the number of examples of a particular kind of historic property (e.g., residences, bridges, archeological sites) should be given careful consideration when deciding the appropriateness of mitigation measures to be implemented if the property must be destroyed or substantially altered. If many examples exist, and it appears that not all are in danger of being lost, it may not be in the public interest to spend considerable amounts of money and time to record in great detail all the architectural elements of a house facing demolition. The same goes for an archeological site--many similar sites in the area not facing the threat of disturbance can argue against extensive excavation of the one facing destruction due to a road project, for example.

Most of the facilities, objects, and structures designated as NHLs under the "Man in Space" and "Astronomy and Astrophysics" themes, are examples from a very small universe, or are unique. This same situation holds for many facilities, objects, and structures that are associated with other kinds of historic scientific achievements. However, rocket launch pads share similar physical characteristics, as do astronomical observatories or wind tunnels. What is in fact unique, and what is representative? What are the best examples, and how are they different from the most readily protected or preserved examples?

Consensus among the preservation community is generally that, where possible, rare or unique historic properties should be preserved. Again, though, as this report makes clear, this is not necessarily feasible or prudent. Except in rare instances scientific equipment is constantly modified and upgraded lest it lose its ability to contribute to scientific advancement (and thus be discarded or cannibalized), and virtually all pieces of scientific equipment in "historic" facilities are both representative and unique in some ways. Clearly, more study is needed on exactly what is most worthy of and amenable to preservation.

The "integrity" of the resource, in terms of the amount of original historic fabric, material, or equipment still extant and/or in use

The *National Register Bulletin 15* defines integrity as:

> "[T]he authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic...period. If a property retains the physical characteristics it possessed in the past then it has the capacity to convey association with historical patterns or persons, architectural or engineering design and technology, or information about a culture or people."

The *Bulletin* goes on to state that integrity has seven qualities that apply to historic properties: location, design, setting, materials, workmanship, feeling, and association (the "direct link between a property and an event, or person...for which the property is significant...and is sufficiently intact that it can convey that relationship"). A property must normally meet at least two of these tests to be eligible for the National Register. In most cases historic scientific equipment and facilities in use today meet at least the design, materials, and association components of integrity. (Other properties significant for their contributions to scientific advancement, such as Edison NHS, exhibit the qualities of location, setting, feeling, and association; it is for this reason that Edison's laboratory is a national park unit.)

For a property to be historically important for its scientific or technological advances does not mean that it cannot be unchanged, or moved to a new location. Many of the active NASA and USAF launch complexes are illustrative here; over time, they have had to be continually modified to support new generations of rockets. The historically significant large telescopes, on the other hand, have seen little physical modification to their basic structures. The body and mount of the 200-inch Hale telescope at Palomar, or the 40-inch refractor telescope at Yerkes, for example, have been little modified since their installation many years ago. What has changed in these cases are the appurtenant drive mechanism, detection instruments, and other electronic and optic systems that enable these telescopes to continue to make their contributions to science.

The issue of integrity and retention/preservation of a property's integrity has important bearings on the question of preservation of these historic scientific facilities. The telescopes and most NASA facilities that meet the criteria for inclusion as NHLs are certainly unique, one-of-a-kind devices, usually very expensive to build. In the case of the telescopes, there is little chance that their basic structure, the feature that gives these historic properties their integrity, will be modified so that they lose the qualities of design, materials, and association to such a degree so as to no longer be a "preservable entity." They need to remain in use, and to replace them would be prohibitively expensive. Except for operational testing facilities or launch complexes, which in some cases undergo major modifications (e.g., LC 39's modifications to launch the shuttle instead of the Saturn rockets) and those facilities that are no longer in use, few structures in use today will undergo modification to such an extent that all integrity is lost. In most cases there should be continuity in function, and thus in integrity of design and materials, and there may always be integrity of association.

Conduct of the evaluation, including the qualifications of the evaluator and persons consulted during the evaluation

It is critical that the person or persons assessing whether a scientific or technological property merits designation as an NHL or qualifies for listing on the National Register have an understanding of the both the historic context of the property, and an understanding of the scientific contributions made by it. In the few Section 106 cases involving the Council, and throughout the conduct of this study, scientists and agency managers have expressed great apprehension about the conduct of such evaluations. In some instances, they disagree with exactly what is being considered historic, and why. With some justification, they are concerned that the historic preservation community does not have an adequate and clear understanding of these issues, including the technology involved, the precise identification and description of historic elements of a given facility, and appropriate boundaries. Problems with NPS' NHL theme studies, including both the process of evaluation and eventual designation, and the substantive content of the studies, have been raised by several agencies and institutions throughout the conduct of the Council's study. Based on Council experience with cases reviewed under Section 106, many problems have been created by insufficient specificity about significant facility features in NHL designations. All of these issues need to be addressed by agencies, including the National Park Service, performing such evaluations, and more scientists and facilities managers should be actively involved in evaluating potentially historic properties.

CHAPTER 5:

The process and result of past interaction between science and technology and Federal historic preservation statutes

When Mission Control Center in Houston was upgraded in 1989, the Council reviewed NASA's action under Section 106. A National Historic Landmark, Mission Control is shown here as it appeared in 1969 during an Apollo mission. When the NHL 25-foot space simulator at the Jet Propulsion Laboratory, opposite, was modified, Section 106 review was also completed as required by Federal regulation.

NHPA, the National Environmental Policy Act (NEPA), and other environmental and resource protection statutes have established a set of Federal policies and implementing programs for the protection of America's natural and cultural environment. Private owners of historic properties may do what they wish to their property without incurring Federal penalties. On the other hand, the Federal Government and private owners receiving any kind of Federal assistance may not without first complying with Section 106.

Existing agency programs for historic preservation

Under Section 110(c) of NHPA, Federal agencies are expected to appoint one official, preferably at the headquarters level with agency-wide authority, to coordinate that agency's historic preservation activities. Most of the agencies examined during this study already have such individuals on staff; most also have existing procedures, guidance, and/or other programs in place to address various aspects of historic preservation. However, except for Army and USN, specific and detailed direction to personnel concerning management of historic properties is largely lacking, aside from general instructions concerning compliance with Section 106. (DOE is currently formalizing procedures for care of historic properties on its lands.) Table 1 summarizes the general status of these programs according to principal agencies involved with

historic scientific and technical properties.

Additionally, many, if not most, of the Federal agencies that were the focus of this study have staff historians and/or archivists responsible for writing official histories of programs and projects, providing reference services, and/or curating manuscript and photographic materials generated by the daily business of government. Table 2 summarizes the resources of these offices.

NASA is somewhat unique in that it is the only agency reviewed in this study that has its own visitor centers and museums, as well as an existing agreement with SI for the disposition of hardware no longer required for active operational programs (see Chapter 6).

Section 106 cases at science and technology facilities

The Council's caseload of agency undertakings referred to it under Section 106 of NHPA has grown steadily to the level of 2,903 in Fiscal Year 1989. SHPOs estimate that they reviewed 100,800 Federal undertakings in Fiscal Year 1988; of that number, 1,524 were handled by the Council during that same period. An additional 652 cases carried over into Fiscal Year 1989; this brings the FY 1988 total to 2,176 cases involving the Council at some level.

The Council has commented on a number of cases under Section 106 of NHPA which involved historic properties at scientific and technical sites over the years. The number of cases concerning modifications or other effects to facilities and structures important for their contribution to the history of science and technology that remain actively in use has been extremely small. There are a number of reasons for this.

First, it is probable that numerous modifications to potentially historic facilities have been made over the years without compliance with Section 106 of NHPA. Second, the 50-year rule normally applied to properties that might meet National Register criteria may have precluded consideration of many otherwise potentially eligible facilities that are considerably less than 50 years old. Third, NPS, SHPOs, and Federal agencies with management responsibilities for such

Table 1
Summary of major existing high tech agency historic preservation programs

Agency	Regulations/ procedures	Specific technical guidance	Availability of historic preservation expertise
Army	*yes*	*yes*	*staff/contract*
Air Force	*yes*	*yes*	*contract*
Navy	*yes*	*yes*	*staff/contract*
Energy	*yes*	*no*	*contract*
HHS	*no*	*no*	*none current*
NASA	*yes*	*no*	*contract*
NSF	*no*	*no*	*none current*
NOAA	*no*	*no*	*none current*

Table 2
Agency history and archives offices

Department of Defense

Air Force
Office of Air Force History, Pentagon
USAF Historical Research Center, Maxwell AFB

Army
Chief of Military History
Chief Historian
U.S. Army Center for Military History, Washington, DC

Navy
Director, Office of Naval History
Director, Naval History Department
Director of Marine Corps History and Museums, Washington, DC

Department of Energy
Chief Historian, Washington, DC

National Aeronautics and Space Administration
History Office, Washington DC

National Science Foundation
Historian, Washington, DC

Smithsonian Institution

Air and Space Museum
Historian, Aeronautics Department; Historian, Space History Department; Archives and Oral History Specialist, Space History Department; Washington, DC

National Museum of American History
Department of the History of Science and Technology, Washington, DC

Department of Health and Human Services
Public Health Service History of Medicine Division, National Institutes of Health, Bethesda, MD

properties have not established identification and evaluation of scientific and technological resources as one of their priorities. Further, where scientific and technological properties *have* been identified as historically significant, this information is not necessarily used effectively or consistently in making decisions about property management.

Most cases related to Federal or federally assisted undertakings at scientific and technical facilities that come under Council review have been "routine," involving nontechnical projects such as parking lots, roads, landscaping or building construction. Actual Section 106 cases involving efforts to recognize historically significant scientific and technical properties are summarized in Tables 3A and B.

The small number of these cases raises questions about the Section 106 process as it has come to be used by agencies in activities affecting historic properties at highly technical or scientific facilities.

Table 3
Principal Section 106 cases involving scientific and technical facilities, 1970-1990

A. Facilities management

State	Agency	Property	Significance (NHL/NR)	Project	Status
AL	Army	Redstone	eligible	oper/mgmt	pres plan under development
CA	AF	Vandenberg	NR	oper/mgmt	PA being developed
IL	DOE	Fermi Lab	eligible	oper/mgmt	PA being developed
MS	NASA	Stennis	NHL	oper/mgmt	draft PA/ superseded by NASA PA
NY	Army	Watervliet	NHL	oper/mgmt	draft pres plan under revision
TX	DOE	Super Collider	--	oper/mgmt	PA signed 1990

(Note: the Council has several Programmatic Agreements with Federal agencies engaged in scientific research for the management of archeological properties on their lands. These are not included in the above list.)

B. Individual projects

State	Agency	Property	Significance	Project
AL	TVA	Muscle Shoals	NR	demolition
CA	NASA	25-foot Space Simulator	NHL	modification
CA	AF	Edwards AFB	NHL	road construction
FL	AF	Canaveral/LC13	NHL	demolition/modification

FL	AF	Canaveral/LC20	eligible	modification
FL	AF	Canaveral/LC26	NHL	demolition
FL	AF	Canaveral/LC36	eligible	modification
FL	AF	Canaveral/LC43	eligible	modification
FL	NASA	KSC/LC39	NR	demolition/modification
IL	DOE	Argonne Lab	eligible	new construction
IL	Army	Rock Island	NHL	rehabilitation
IL	Navy	Great Lakes	eligible	rehabilitation
MD	Army	Aberdeen	eligible	cleanup
MD	HHS	NIH	eligible	new construction
MD	NOAA	Gaithersburg Observatory	NHL	transfer of ownership
MA	NPS	Springfield Arsenal	NHL	interpretation
NJ	NPS	Edison NHS	NHS	interpretation
NJ	EPA	Bell Labs	eligible	waste disposal
NM	DOE	Los Alamos	NHL/elig	road construction
OH	NASA	Lewis	NHL	modification
OH	AF	Wright-Patt AFB	eligible	various projects
SC	DOE	Savannah River	eligible	various projects
TN	TVA	Ocoee #1	NR	rehabilitation/modification
TN	TVA	Ocoee #2	NR	rehabilitation
TX	NASA	Mission Control	NHL	modification
VA	NASA	Variable Density Tunnel	NHL	structure removal
WA	DOE	Hanford	NR/elig	construction
--	Navy	USS Missouri	NR	modification
--	Navy	USS Nautilus	NHL	decommissioning

- ☐ Agencies with an existing system for integrating historic preservation into routine business, including early and meaningful consultation with the SHPO and/or the Council, can address preservation concerns effectively through the Section 106 process.
- ☐ Many of the undertakings at scientific and technological facilities concern routine maintenance and retrofitting that may damage historic structures but have little, if any, effect on ongoing research or technical operations.
- ☐ Of those undertakings that could affect historic scientific or technical resources, alteration as a result of equipment upgrade is likely to be problematic because of general uncertainties about effects on historic properties as well as the overall timing of the modifications.
- ☐ SHPOs and other historic preservation professionals have little understanding of the historical foundations of modern science and technology or of the operation of scientific and technological research institutions.
- ☐ Facilities managers and other concerned research personnel have little understanding of technical aspects of historic preservation and specific treatment of historic resource problems.
- ☐ Apparent "delays" in the historic preservation review process seem to derive primarily from inadequate or poorly understood procedures, lack of understanding of the effects of specific projects on the historic values of facilities, miscommunication between consulting parties, or outside forces.

NASA case study examples

As the result of a careful review of past Section 106 cases involving scientific and technological resources, the Council determined that, to date, cases involving NASA facilities were most applicable to the issues surrounding this study. Six case histories of NASA undertakings that were subject to Section 106 review follow.

Of these six cases, two relatively recent cases have been cited by concerned academic research institutions in relation to the potential for delay they perceived to be inherent in the Section 106 review process. These cases involve modifications to the 25-foot space simulator at the Jet Propulsion Laboratory in Pasadena, California, which is a NASA facility operated under contract by the California Institute of Technology, and modifications to the Mission Operation Control Center/Apollo Mission Control Room at Johnson Space Center in Houston, Texas.

For comparison, the Council examined an additional four cases involving NASA: the relocation of the variable density tunnel at Langley Research Center in Langley, Virginia; modifications to the rocket engine test facility at Lewis Research Center in Ohio; installation of a parking lot adjacent to the Vehicle Assembly Building, Launch Complex 39, Kennedy Space Center, Cape Canaveral, Florida; and modifications to the mobile service tower at Launch Complex 13, Cape Canaveral Air Force Station in Cape Canaveral, Florida (NASA use under USAF management).

These six cases vividly illustrate the range of agency undertakings affecting historic properties, in addition to a number of issues surrounding this study. They also highlight the problematic nature of consultation for these particular types of historic properties.

Most cases related to Federal undertakings at technical facilities have been routine, involving such projects as roads, parking lots, or landscaping. These archeological sites being excavated at Los Alamos National Laboratory in New Mexico were the subject of Section 106 review in 1986.

Modification of Apollo Mission Control (1989)

In June 1987, NASA initiated consultation with the Texas SHPO on plans to upgrade its Mission Control Center (MCC) at Johnson Space Center in Houston. The MCC, commonly known as the Apollo Mission Control, is an "NHL significant for its association with moon landings." NASA planned to construct a new five-story space station control center adjacent to the existing three-story MCC, to upgrade the equipment and facilities, and to reconfigure the two identical flight control rooms in the MCC, which have controlled every U.S. manned space mission since their construction in 1965. Upgrading and reconfiguration were deemed necessary by NASA to meet future shuttle and space station mission needs and will include enhanced flight control equipment with new computers, consoles, projectors, and wiring systems.

In response to a letter from the Council asking for information on the historic significance of the facility, the NPS responded that:

> Through television and the print news media the scene of activity at the Apollo Mission Control during the first manned landing on the moon was made familiar to millions of Americans. When Neil Armstrong reported his "giant leap for mankind" to Mission Control his words went immediately around the world and into history. The Apollo Mission Control Center and Launch Complex 39 at the Kennedy Space Center are the two resources that symbolize for most Americans achievements of the manned space program leading to the successful first moon landing during the flight of Apollo 11 in July 1969.

In accordance with the Council's regulations, NASA and the Texas SHPO determined that upgrading the MCC would have an adverse effect on the NHL. Accordingly, NASA subsequently consulted with the SHPO to review measures that would avoid or reduce the effects of the planned upgrade on the historic facility. The Texas SHPO asked NASA to consider alternatives that would preserve in place one of the flight control rooms, noting that a new control room could be constructed in the new space station control center being built adjacent to the present MCC. NASA concluded that this was not feasible, given the integrated nature of the MCC, the need for space, and the prohibitive cost of new facilities. In a letter to the Governor of Texas, NASA stated that, "[t]he contemplated changes will inevitably lead to a facility with internal features that are different in function and appearance from the original Apollo design. Although changes occur, the facility will retain its identity and will be readily recognizable, inside and out, as having evolved from the original Apollo design."

After extensive consultation with the Texas SHPO, no agreement could be reached concerning treatment of the landmark facility. NASA was prepared to implement several mitigation measures, including compiling complete photographic and technical documentation of the Apollo flight control rooms, along with flight plans, checklists, and procedures of missions controlled from the MCC. The agency also was willing to explore the potential for replicating an Apollo Flight Control Room for a new visitor center to be built at the Johnson Space Center. NASA could not preserve the existing facility in place.

Believing that further consultation would not lead to an agreement on how to treat the facility, in June 1989 NASA terminated consultation with the Texas SHPO and requested the comments of the Council. In accordance with the Council's regulations, comment was rendered to the administrator of NASA following a staff visit to JSC and a meeting with representatives of NASA and the SHPO. In his letter conveying the Council's comments, Chairman John F. W. Rogers stated that while there were several valid constraints to the preservation of the MCC, and while NASA's proposed mitigation measures would assist in preserving information about the MCC during its Apollo heyday:

> [W]e believe more can be done by NASA in response to Section 110(f) of the National Historic Preservation Act for this National Historic Landmark. Serious consideration needs to be given by NASA to long-term preservation of hardware and furnishings, organization of and public access to Mission Control Center archives, and appropriate public interpretation of the Apollo program.

The letter recommended several steps that NASA could undertake to better manage this NHL, including working with the Texas SHPO on a historic preservation plan for the MCC to act as a guide to preservation of significant Apollo-era components and for future necessary modifications. Other steps suggested were the possible expansion of visitor information about the historic significance of the MCC, and the preparation of a documentary record of the MCC according to the standards of the Secretary of the Interior.

In its response to the Council's comments, NASA noted that while it must go forward with the planned modifications to the MCC, it will actively work to better educate the public about the historic significance of the MCC and continue to work with the Texas SHPO. NASA also noted that it has established the Johnson Space Center Historic Preservation Committee to preserve original documentation and equipment used in the MCC and that this information would be made available to the Texas SHPO.

Analysis: Approximately two years elapsed between the time NASA initiated consultation with the Texas SHPO and responded to the Council's comments on the project. However, had NASA been more familiar with the historic preservation process and included the Council early in consultation, this time could have been reduced considerably. Ultimately, the lengthy delay in time must be attributed to NASA's sincere desire to resolve its disagreement with the State of Texas over the fate of Mission Control. The disagreement between the state and NASA led to a letter from the governor to the President, and the Texas SHPO and NASA are continuing to consult about ways to preserve and interpret the historic interior of Mission Control.

Relocation of the variable density tunnel (1989)

In 1989 NASA's Langley Research Center initiated consultation with the Virginia SHPO over plans to relocate their landmark variable density wind tunnel from its original position to a location elsewhere within the installation. Constructed in the early 1920s for the National Advisory Committee for Aeronautics, predecessor of NASA, the variable density tunnel was the first pressurized wind tunnel in the U.S. where high speed and high altitude aeronautical performance could be investigated. The tunnel remained in use, in various capacities and modifications, until it was declared unsafe in 1978. It has since been used primarily for storage.

Following consultation with the Virginia SHPO, and an on-site visit with SHPO and Council staff, NASA determined that it would move the structure (a large ovoid steel pressure tank) from its existing location, to an outdoor area adjacent to the Langley employee center and cafeteria for interpretive purposes.

Analysis: This case involves an inactive facility whose significance has never been in question, but whose continued maintenance and use for public interpretation purposes has been problematic. It illustrates the dilemma faced by NASA in its continued need to maximize space at some of its facilities like Langley, which is located within the confines of Langley Air Force Base. There were no delays in the undertaking, and all parties have expressed satisfaction at the public interpretation use of the structure.

Upgrading the 25-foot space simulator (1988)

The 25-foot space simulator was designated an NHL as part of DOI's 1984 "Man in Space" theme study. The simulator was deemed an NHL because of its engineering achievements in optics, cryogenics, and vacuum technology. Even today, the simulator's collimator, an optical device which causes light to form in parallel rays, and its solar intensity simulation characteristics are without peer. The simulator has been used since the 1960s to test satellites and other equipment intended for space use.

NASA planned to replace several aging components in order to maintain the simulator's vital testing capability. The improvements were necessary to meet the more demanding specifications of current space technology. NASA proposed to replace obsolete vacuum pumps with advanced

cryogenic-type vacuum pumps, refurbish the collimator mirror's reflective surface, and install improved solar-simulating lights (the existing ones were nearly 30 years old). The Council concurred in NASA's determination of no adverse effect for the refurbishment, although not before some delays took place in the initial consultation between NASA and the California SHPO.

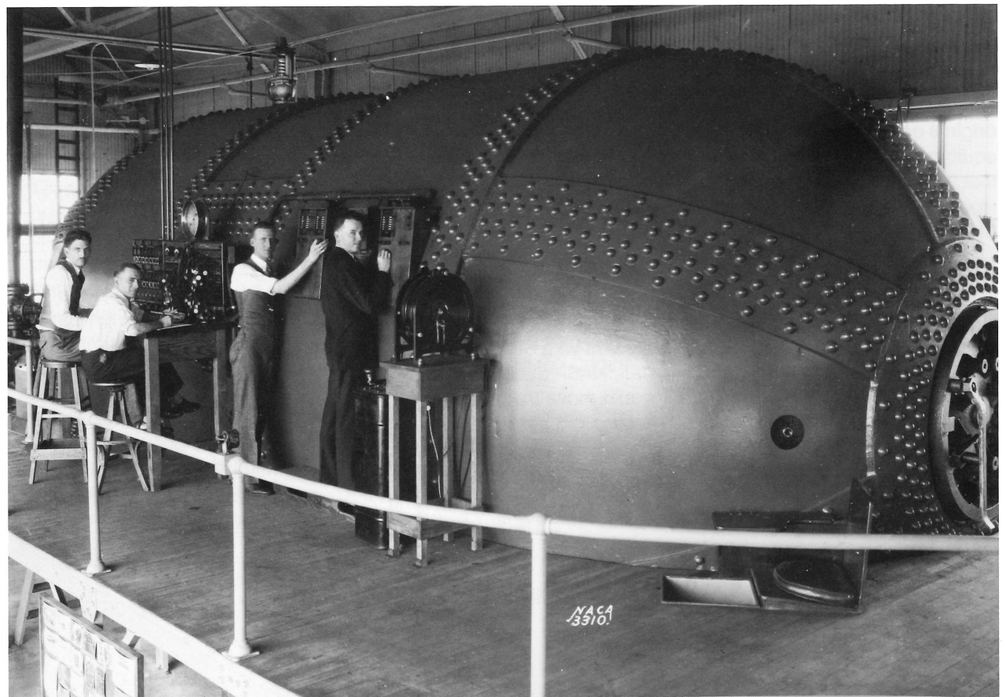
The initial request for repairs was received by the NASA facilities office in March 1988. NASA requested SHPO comment in April 1988. In June 1988, NASA requested Council review of its determination of NAE; concurrence was provided in July 1988. Thus, approximately four months had elapsed from the time NASA began consultation.

Analysis: The reasons for this delay appear to emanate from uncertainty on the part of the SHPO about the nature of the project's effects on the historic facility, and a heavy workload that interfered with more expeditious consideration of the case. Since NASA was unclear about the SHPO's needs, the agency provided considerable additional documentation. Neither party was equipped to address the question of whether or not the vacuum pumps should be considered significant historic equipment, or whether some form of mitigation should be instituted for their removal. Eventually, with the Council participating, it became clear that some simple records of the equipment being removed, including retention of original construction documents, would suffice to remove any possible adverse effects and the project proceeded. This case illustrates the problems that can occur if a property is designated as historically significant, but there is no common understanding about what elements of it contribute to that significance, what happens when alterations are necessary, or how it should be managed in general.

Modification to instrument and control area, rocket engine test facility (1988)

In 1986, NASA's Lewis Research Center in Cleveland, Ohio, initiated consultation with the Ohio SHPO about plans to modify their rocket engine test facility, a NHL. Lewis planned to construct a new instrument

In 1989, NASA's Langley Research Center consulted with the Council under Section 106 before it moved its landmark variable density wind tunnel from the original location. This is an early photograph of the wind tunnel, built in the 1920s.



room within the test facility. As the area proposed for the new instrument room contained only a locker room, shower and other service facilities, it was determined that the project would not adversely affect elements of the facility that contribute to its landmark significance. On May 2, 1988, the Council received documentation describing the proposed modifications from the chief of Lewis' facilities engineering division. Shortly after, the Council received the comments of the Ohio SHPO. After review of the proposed modifications, on May 26, the Council concurred with NASA's and the Ohio SHPO's no adverse effect determination, and the project proceeded.

Analysis: There was no particular delay in the review of this undertaking, although NASA's initial discussions with the Ohio SHPO languished as NASA's budget priorities changed. But it does illustrate once again that there was some question about the historic significance of the facility, and how a given project might affect it.

Removal of launch platform, Launch Complex 13 mobile service tower (1988)

In 1988, NASA and USAF initiated Section 106 review for the General Dynamics Space Systems Company's proposal to remove ten platforms from the mobile service tower of Launch Complex (LC) 13 and install them on the mobile service tower of LC 36 to enhance commercial satellite launch capability. The platforms are extendable, vertically adjustable, horizontal steel structures located on each side of the tower, providing access to the missile when positioned for launch. LC 13, constructed in 1956 for USAF's Atlas Missile Program, is a listed property in the Cape Canaveral Air Force Station NHL. Deactivated in 1978, it remains USAF property. Launch Complex 36, a NASA property currently operated by General Dynamics as a commercial venture for satellite launch, has been determined to be eligible for listing in the National Register for its part in NASA's Atlas/Centaur rocket development program.

An MOA among NASA, USAF, the Council, and the Florida SHPO was executed for the project in 1988. Alternatives to the removal of the platforms from the NHL property included the "no-build" alternative, as well as constructing new platforms for LC 36 while allowing those on LC 13 to remain in place. Neither of these options was feasible: the "no-build" option would not have enhanced the capability of LC 36, while the cost of new platforms would have been prohibitive. As part of the measures to mitigate the effects of platform removal on the NHL property, USAF would compile original "as built" drawings of LC 13, along with contemporary photographs, and prepare a narrative historical description of the facility from its construction forward. NASA would do the same for LC 36. This information would then be given to the Secretary of the Interior for placement in the National Historic Architectural and Engineering Records (HAER), at the Library of Congress, and distributed to the Florida SHPO, the Kennedy Space Center archives, and to USAF museums at Cape Canaveral, Wright Patterson Air Force Base, and the Eastern Space and Missile Center Historic Office at Patrick Air Force Base in Florida.

Analysis: This case is a good illustration of "normal" consultation for these types of facilities. Each of the consulting parties agreed that it was in the public interest to proceed with the undertaking, and further agreed that removal of one component of an engineering structure could be mitigated through appropriate recordation and archival retention of documents.

Construction of the parking area, Vehicle Assembly Building, Launch Complex 39 (1985)

The massive Vehicle Assembly Building (VAB) at Kennedy Space Center is a component of the LC 39 NHL, the assembly and launch site for the Apollo moon missions. In 1985, NASA proposed to construct car parking facilities near the VAB to alleviate parking shortages resulting from increased activity at the complex. NASA considered several alternatives. The Florida SHPO determined that NASA's preferred alternative, one large parking facility, would not adversely affect LC 39.

Accordingly, NASA requested the comments of the Council on August 22, 1985. After review of the project, the Council concurred in the no-adverse-effect determination seven days later.

Analysis: Two members of the Council staff visited Kennedy Space Center in July 1985 to discuss how NASA was managing KSC historic properties. The parking lot project was discussed during this visit. It was agreed that, although the proposed parking area was a "normal" accretion that had little potential for affecting the historic attributes of the LC 39 area, possible effects of some alternatives on the Apollo crawlerway or other original components of the complex's plan warranted review. When Council comments were requested by NASA, the Council was able to quickly concur in the proposal.

The regulatory implications of "historic" designation

The perception that the Section 106 review process is lengthy and difficult derives from an incorrect series of assumptions on the part of Federal agencies with regard to historic preservation law. For example, NASA, USAF, NSF, and various institutions receiving NSF grant funds have expressed concern about the ramifications of having their properties listed as NHLs, given the requirements of Section 106 and 110(f) of NHPA. Three major points should be kept in mind with respect to these concerns.

☐ **First, Section 110(f), which applies to NHLs, and Section 106, which applies to properties both included in and eligible for inclusion in the National Register, are very similar.**

Section 110(f) states that:

> Prior to the approval of any Federal undertaking which may directly and adversely affect any National Historic Landmark, the head of the responsible Federal agency shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such Landmark, and shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking.

In the Council's experience with Section 110(f), which was added to the statute in 1980, there has been no reason to deviate significantly from the normal processes laid out in Council regulations. Section 800.10 provides specific guidance for review of actions affecting NHLs; the only additional provisions are that (1) the Council must be invited to be a consulting party when an adverse effect to an NHL will occur; and (2) NPS may be consulted about the significance and effects on NHLs that would be adversely affected.

It is to be expected that management responsibilities assumed by agencies like NASA and USAF for NHLs would be little different from those already assumed as a result of the properties' likely eligibility for the National Register.

To take a hypothetical example, an agency proposes to dismantle a rocket-launch tower that has been designated as a NHL. Under both Sections 106 and 110(f), as interpreted by Council regulations, the agency would be required to consider alternatives to the demolition in consultation with the Council, the SHPO, and other interested parties, to consider mitigation measures, and to seek agreement on a plan balancing the needs of historic preservation against its mission requirements.

If the same launch complex had not been designated as an NHL, the agency, in consultation with the SHPO would first have to review the property to determine whether it was eligible for the National Register. If the property was deemed eligible the agency would then go through precisely the same steps as those outlined above before reaching a decision concerning further action. In other words, the principal management effect of the NHL listing is to save the agency the step of evaluating the historical significance of the property.

Of course, in view of the fact that the "normal" age for a property's consideration for the Register is 50 years, relatively few facilities important for aerospace history under NASA jurisdiction would be considered outside of specific DOI designation. While the Palomar Observatory did not begin operation of its 200-inch telescope until the late 1940s, its mirror, which took 12 years to grind and polish, was cast in the mid-1930s; the telescope mirror, at least, is over 50 years old, but its historical achievements in astronomy postdate 1948.

☐ **Second, given the level of activity of some agencies it is probable that many undertakings have the potential to affect historic properties. Few of these undertakings, however, are brought to the attention of SHPOs or the Council.**

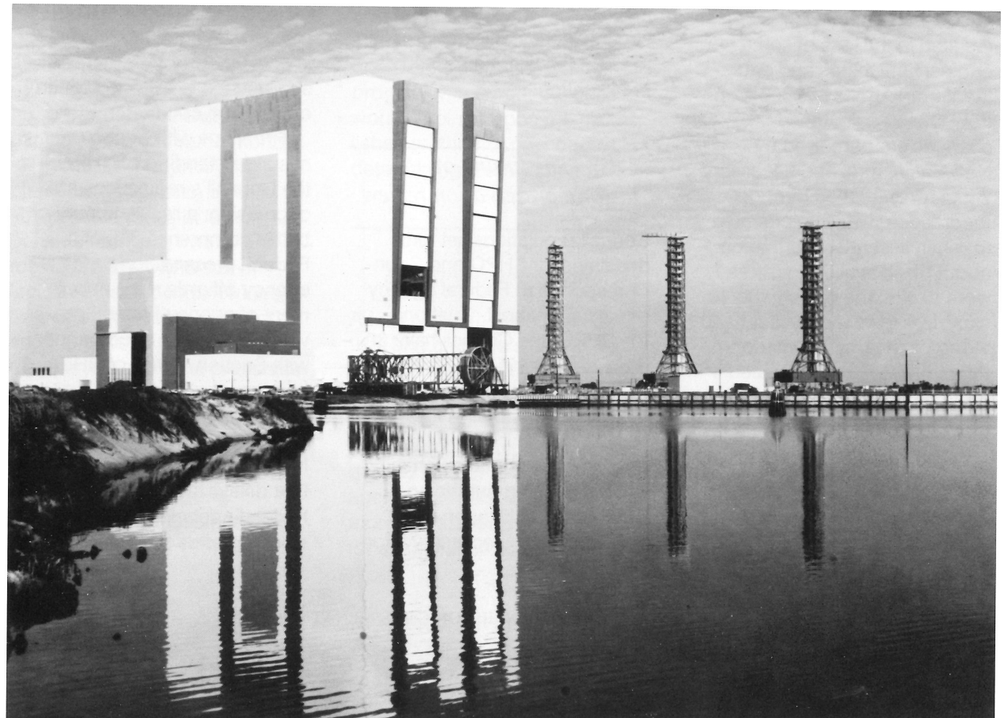
☐ **Third, it should be emphasized that when consulting with agencies under Sections 106 and 110(f), the Council does not see itself as the proponent of preservation over fulfillment of agency missions. The Council perceives its role as one of working with agencies to ensure that historic preservation concerns can be accommodated *within* the agency's mission requirements.**

Summary Discussion

Alternatives to proposed actions

In all of the Section 106 cases described above, the outcome, or resolution, designed to balance the Federal agency's ongoing mission with the preservation of elements of its physical historic legacy was achieved through consultation with the relevant SHPO and in some cases, the Council. Council involvement took the form of reviewing alternatives and measures that would eliminate, lessen, or mitigate impacts to historic properties. In past Section 106 cases involving scientific and technical facilities, as with many undertakings the Council reviews, it was not feasible to radically alter the agency's original plans simply to "preserve" historic properties. The Section 106 process, rather, explored practical adjustments that could be made to preserve essential information about the facility. In some instances, such as Apollo Mission Control, enhanced public interpretation was a goal. In these cases, one common mitigation measure was recordation, the compiling of information allowing for an accurate physical or, more commonly, paper, reconstruction.

Construction of the parking area at Kennedy Space Center's Vehicle Assembly Building, Launch Complex 39, was the subject of Section 106 review in 1985.



Effects of modifications on historic facilities

This chapter has described a variety of Federal undertakings at scientific/technological facilities, ranging from the installation of ancillary facilities such as parking lots, to the construction of new buildings near historic properties, to modifications of historic facilities or pieces of equipment. In cases where an obsolete or unused facility is "cannibalized" for parts, such as the removal of launch platforms from USAF Launch Complex 13 for reuse at NASA's complex 36, there is a clearly deleterious effect to the integrity of the original facility. The act of component removal and reuse elsewhere can initiate a process whereby a facility is completely cannibalized for its parts. However, this is standard engineering practice at such facilities, and always has been. Likewise, the complete renovation of the flight control rooms at Johnson Space Center resulted in the loss of some original furnishings and equipment from Apollo Mission Control. Once again, these changes are perceived by NASA as natural and necessary. While "preservation through recordation" was implemented to retain essential information about these facilities, visitors were denied the opportunity to experience the facility first hand. Video or film documentation might help to meet this need if done more systematically for preservation record purposes.

Modifications to NHLs like those described at Lewis Research Center and the VAB at KSC, on the other hand, did not result in the loss of qualities that distinguish them as NHLs.

Modifications that result in a historic property's loss of integrity *can* have a beneficial effect, however, if those modifications result in the continued use of a facility or structure. A case in point is Launch Complex 39 at Kennedy Space Center. Launch of the space shuttle required extensive changes to this National Register property where the Apollo moon shots lifted off during the late 1960s and early 1970s. Changes were required to keep the complex in good working order. Likewise, proposed changes to one of the frontline astronomical observatories would presumably be intended to keep it on the cutting edge of science and thus in excellent functioning order. This report has emphasized this sort of "trade-off" in several places: active facilities must constantly evolve if they are to continue to make scientific or engineering advancements. Under the right circumstances, this process can result in the historic property's preservation.

The timing of historic preservation review

Council regulations set forth deadlines for SHPO and Council response to Federal agency requests. In most situations, the SHPO and Council have 30 days to respond, if the agency has carried out its responsibilities as set forth in the regulations. This would include making early contact with the SHPO, carrying out the appropriate identification steps, and submitting necessary information to the SHPO and the Council.

It is the Council's experience, as reported to Congress in appropriations and regulations effectiveness hearings, that SHPO and Council delays in responding to agencies often stem from nonadherence to, or misunderstanding of, Council regulations. Usually, either the information specified in Council regulations [36 CFR § 800.8] is not provided by the agency, which results in delays because the material must be requested, or the agency does not initiate consultation with the SHPO in the early planning stages when the project, the historic properties involved, and the alternatives to existing plans can be fully considered.

There have also been delays, as in the case of the 25-foot space simulator at JPL (above), where the SHPO was unable to review NASA's proposed action given their limited understanding of what they were being asked to judge. This problem has been exacerbated in part by fuzzy statements of significance in historic property evaluations conducted by NPS.

Problems with agency misunderstanding of NHPA and the Council's regulations are decreasing, a result, in part, of better comprehension of the Federal preservation process by agency officials. The appointment of agency Federal preservation officers in accordance with Section 110(c) of NHPA has contributed somewhat, as has a general move toward earlier discussions with the SHPO. Nevertheless, the perception that delays still cited by some Federal agencies are the inevitable result of compliance

with Federal historic preservation law has continued to serve as a justification for occasional attempts to win exemption from compliance. Uncertainty about the historical significance of facilities, and how agency actions are affecting historic values, will continue to provide grist for these concerns wherever properties not traditionally recognized to be historic are under discussion.

The "public" nature of the Section 106 process

When the Council revised its regulations in 1986, it strengthened the role assigned to the public in the Section 106 process. The reasoning behind this decision was that local citizens were typically most affected when Federal activities impact historic properties and therefore, should have a say in the Section 106 process. Additionally, it was recognized that public and local or regional organizations could often provide assistance to the Federal agency in identifying and evaluating historic properties and in determining appropriate treatments for them. The Council's implementing regulations list several categories of "interested persons," ranging from municipalities, owners of affected lands and Indian tribes, to preservation organizations and the general public, who may play a role in the preservation process, depending on the degree of their legal interest in the historic property. The Council encourages Federal agencies to use their existing procedures for public participation in the Section 106 process, so long as those procedures provide reasonable opportunities for the public to learn about proposed Federal actions and to contribute to the decisionmaking process.

The Council has issued guidance entitled *Public Participation in Section 106 Review: A Guide for Agency Officials* (1989) to guide agencies in ensuring that the public has the opportunity to make its views known in Federal projects subject to Section 106 review.

One of the principal concerns of scientists interviewed was that the Section 106 process could establish a precedent for public review of scientific research proposals. Scientists believe this might occur in two ways: either by using historic preservation issues to dictate the kinds of research carried out at functioning historically significant facilities or by continuing to expand the public participation provisions of Council regulations to allow public comment on competing research proposals. The first could create problems if not properly monitored; the second would impinge upon the established method of peer review in determining scientific merit.

The costs of historic preservation

A final concern raised by scientists and managers had to do with the expense of historic preservation activities. Clearly, there is an administrative cost to historic preservation that is frequently hidden in large Federal agency budgets; it becomes more apparent and obvious if, for example, an academic institution were asked to photograph a historic facility prior to its modification or to assemble historic documents for permanent archival purposes. Institutions with limited staffs would have to devote a significant portion of resources to administer the process by preparing written justifications for alterations to historic facilities and meeting with the SHPO and others to discuss projects. Plans would be completed at considerable direct and indirect cost.

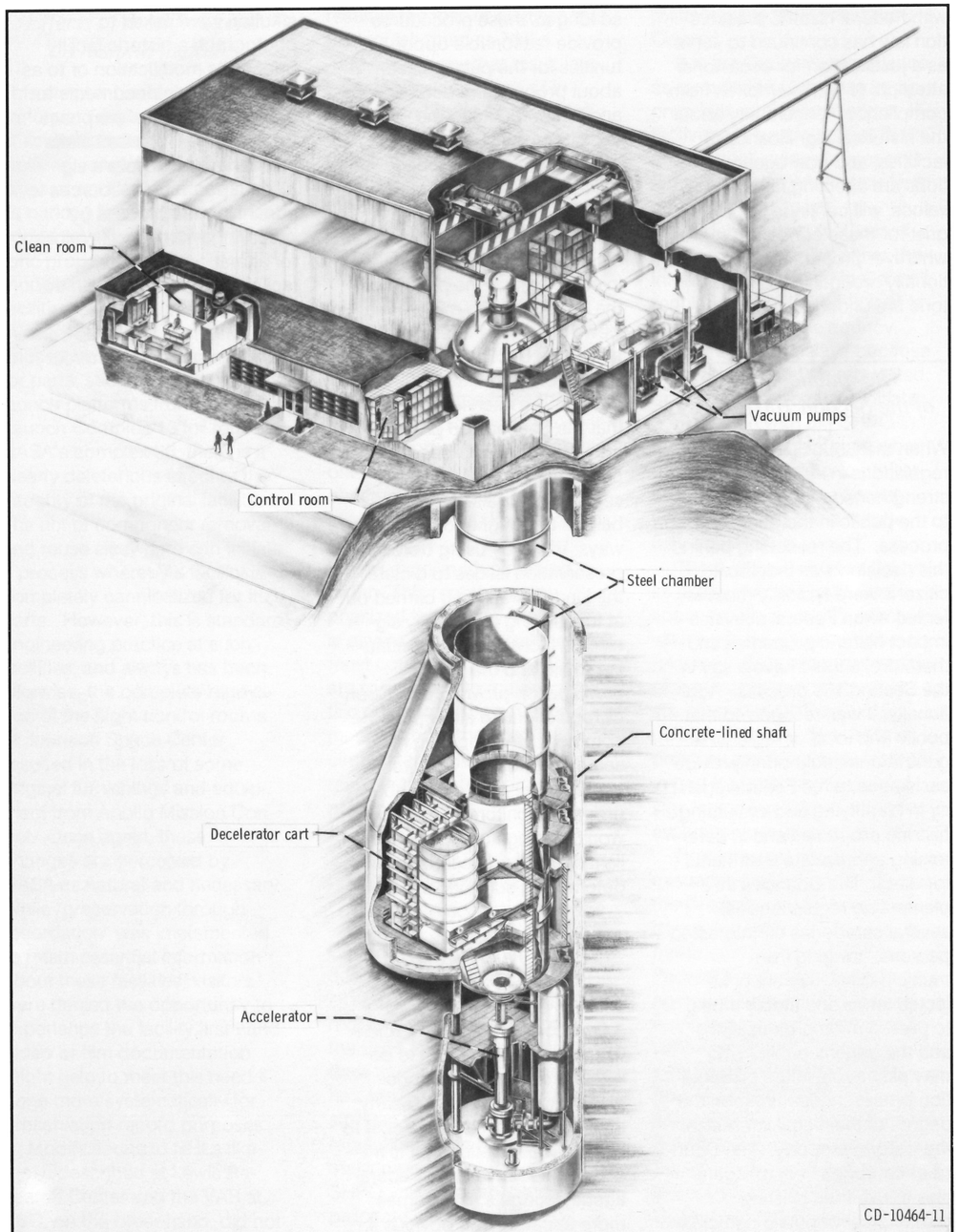


Figure 12. - Schematic diagram of 5- to 10-Second Zero-Gravity Facility.

CHAPTER 6:
Preservation/facility mission options available to achieve balance

This chapter describes and assesses in detail programs actively concerned with the protection and enhancement of America's scientific and technological heritage within Federal agencies. It also reviews various options available to agencies that can preserve and capitalize on their respective scientific legacies and assist in the mitigation of effects when historically significant facilities are upgraded.

Much of this information was gathered during Council staff field visits to installations as part of this study. On these visits, the staff noticed that many of the people attending the meetings were scientists and managers who entered the workforce in the two decades after World War II, entering their agencies on the "ground floor" in the 1950s and 1960s. These people, who are extremely knowledgeable and proud of their agencies' achievements, are preparing to retire. They wish to see their respective agencies better recognized for their scientific contributions by future generations.

Congress specifically requested that this study consider Federal agencies connected with the "Man in Space" and "Astronomy and Astrophysics" themes. The following discussion, therefore, addresses existing programs for the enhancement of historic properties in these two areas. Other

Recordation and educational programs for the public are two of the preservation options available to agencies that own historic scientific properties. The schematic diagram at left documents the NHL zero-gravity research facility at NASA's Lewis Research Facility in Cleveland. The visitor's center at the John C. Stennis Space Center in Mississippi interprets historic space-related events.

programs are considered for comparative purposes as needed.

Range of agency programs to protect and enhance historic properties

Identification and maintenance of historic scientific and technological properties

All Federal agencies have programs and procedures for the maintenance, repair, and upgrading of their real property and facilities. At the installation level, this is usually handled through an office of facilities management, planning, or real estate. In most cases, it is the responsibility of these offices to initiate the Section 106 review process when rehabilitation or new construction is planned to ensure the protection of historic properties under the organization's care.

The PA between NASA, the Council, and NCSHPO sets forth a process by which NASA will "take into account" the effects of its projects on its NHL-status properties. The agreement lists the kinds of activities that have the potential to alter characteristics of NHL properties, and are thus subject to the agreement, and sets forth a consultation process to resolve disputes that may arise between the need to proceed with a project as originally proposed and the responsibility to protect the landmark property. NASA views these issues as facilities management concerns rather than spaceflight, space science, or other operational program areas *per se*. Thus, the associate administrator for management signed the PA on behalf of NASA, although active program operations decisions and priorities clearly drive facilities management needs.

NASA's PA, however, covers only those historic properties formally determined by the Secretary of the Interior to be historically significant at the national level. These 20 NHLs were identified in the NPS "Man in Space" study and included in the PA. The agreement does not contain provisions for the ongoing identification, evaluation, and treatment of properties potentially eligible for the National Register of Historic Places. Archeological sites, for example, occasionally are identified as subject to effect on NASA lands during the Section 106 process. Other properties may meet the National Register criteria that have not been examined through this particular NHL theme.

By comparison, NSF only provides grants for scientific research. In this capacity, it directly manages no historic properties. With the recognition that its grant support could result in effects on important historic properties, however, NSF began discussions with the Council earlier this year on a PA for its research grants programs. A logical focus was on grants for astronomical and astrophysical research where such funds might be used to alter the character and use of historic observatories and laboratories. Negotiations were still in process at the completion of this report.

Other Federal agencies, for example DOD and DOE, currently have or are instituting programs for the management of their historic properties. Since 1984, Army has had in place a regulation [AR 420-40] which requires the development and implementation of a historic preservation plan at each installation; several installations, including Fort Monroe in Virginia, the Presidio in California, Fort Sheridan in Illinois, and Fort Leavenworth in Kansas, are NHLs. Many other military installations contain at least some historic properties. These plans would identify and evaluate potentially historic areas, including buildings, structures, objects, and archeological sites, and provide guidelines for their consideration in future development of the base. Likewise, DOE is working toward development of comprehensive cultural resource management plans for its installations, most of which contain properties historically significant for their role in highly scientific and technological research, e.g., Los Alamos National Laboratory in New Mexico and Oak Ridge National Laboratory in Tennessee.

Institutional histories and the popular press

As mentioned in Chapter 5, many Federal agencies have on staff official historians and/or archivists whose duties are to compile and provide historical information on the agency and to manage repositories of information generated by the agency in the past. Additionally, prominent agencies such as NASA, the branches of DOD,

and prominent individual Federal programs, e.g., the Manhattan Project, have been subjects of official and unofficial histories.

While these personnel and the written histories they and others produce assist in preserving agencies' official past, there is little evidence that these assets are fully utilized with regard to preserving and promulgating the historic significance of their scientific and technological facilities. In many instances, the more technical historical aspects of a particular project may still be classified for national security reasons. In others, the political and administrative history of an agency program gives short shrift to scientific or engineering accomplishments. It is the more popular publications, such as *Invention and Technology* or *Omni,* that provide typically in-depth information about America's scientific heritage in a format accessible to the general public.

Still, as any museum-goer knows, there is a major difference between reading about historically important scientific events and viewing their physical components. The major focus of and primary reason for this report is to determine how Federal agencies can preserve the physical reminders of their scientific past while at the same time conducting their respective missions. Kennedy Space Center (KSC) provides an excellent example of why this subject is important. Approximately *2.5 million* people visited last year to view the physical manifestations of the National space program that they had seen on television and in photographs. The large number of visitors to KSC suggests that the public is intensely interested in the space program and its history, and wants not only to read about but to see, examples of NASA's accomplishments.

Public information centers, museums and displays

Virtually all major Federal scientific installations maintain a public information center/office or visitor information center where the interested public and the press can obtain information on the workings of the installation. The available information, however, varies in detail according to the nature of the work carried out there. For example, all NASA installations contain visitor information facilities; because many of its activities are constantly in the public eye, its visitor displays and pamphlets typically contain a wealth of information. Further, a significant amount of public relations material dating to the early days of the space program is still available if one knows where to look and whom to contact. On the other hand, the DOE Los Alamos National Laboratory, where much of America's nuclear weapons research is carried out, is historically significant, but since much of the research conducted there is classified, little substantive information about the lab's specific achievements is available to the public.

One manner in which scientific research installations provide historical information to the public is through their museums. NASA facilities, most DOE nuclear research facilities, many military installations, the Smithsonian Institution (SI), and many private scientific institutions that receive Federal assistance for research, e.g., Cal-Tech's Palomar Observatory, contain museums where the physical components of significant scientific and technological achievements are on display. The degree of institutional support these museums receive from the Federal Government varies greatly. SI's National Air and Space Museum and the museum and visitor's center at KSC are excellent examples of government-owned museum facilities where science and technology are preeminent. SI is America's national museum, and it has a formal agreement with NASA for the acquisition of "artifacts, many with great historical value and others with great value for educational, exhibition, and other purposes, relating to the development, demonstration, and application of aeronautical and astronautical science and technology of flight." The museum at Palomar Observatory, on the other hand, contains no artifacts or equipment; it instead features several photographic displays of its discoveries along with a British Broadcasting Corporation video on the construction and operation of the 200-inch Hale Telescope which is narrated by the British astronomer and popular author Patrick Moore. Film is an excellent medium for interpretation in such instances.

Falling somewhere between these extremes are facilities like the Alabama Space and Rocket Center (S&RC) in Huntsville, Alabama, adjacent to the Marshall Space Flight Center. Marshall maintains a visitor's center at the S&RC and contributes

material for displays but the actual museum is owned and operated by the State of Alabama through a combination of State and private funds. S&RC offers bus tours of Marshall's facilities, including organized visits to several buildings and facilities where ongoing research is being conducted. However, during the Council staff's visit there for the purpose of this study, the staff got the distinct impression that there was room for NASA itself to take a more active role in public outreach.

NASA also is active in promoting basic science education through its Teacher Resource Centers and has mobile facilities to reach areas of the country not convenient to a NASA installation.

The NPS report, *Man in Space: Study of Alternatives*, discusses NASA and Army NHL facilities with regard to visitor information and education potential in detail, suggesting various alternatives, with complete funding through which the history of America's space efforts could be better conveyed to the public. As outlined in Chapter 7, these national and site-specific museum facilities are one of the most important means through which scientific and technological facilities can present historical information to the public and, therefore, assist in the preservation of historically significant elements of their scientific legacy. However, they need to be linked to onsite preservation and public access where that remains a reasonable and viable option.

Measures to mitigate the effect of mission needs on historic properties

Council regulations are designed to explore ways to "avoid or reduce effects on historic properties that meet both the needs of the undertaking and preservation concerns" [36 CFR § 800.3(a)]. From a preservation point of view, the most effective course of action is to design the undertaking so as to completely avoid affecting the historic property. As this report emphasizes, this is rarely feasible. Within the institutional structure of Federal scientific and technological agencies, however, there exists a variety of ways, currently not fully utilized, through which the historical significance of scientific advancements can be more effectively conveyed to the public. If these techniques were fully employed, the effects of necessary changes to scientific facilities and structures could be more effectively mitigated and historical values enhanced.

Range of mitigation measures

A great variety of mitigation measures can assist (and have been utilized in the past) in preserving important information about facilities and structures that must be altered or removed altogether. These measures would not necessarily impede the scientific and technological missions. For example, Federal agencies and federally assisted organizations could:

- *locate and archive copies of shop drawings for their historic facilities. These could be developed in consultation with NPS's Historic American Engineering Record (HAER);*
- *locate and archive photographs and video or movie footage of facilities at various stages of use over the years;*
- *prominently display and describe the many scale models of historic structures, facilities, and hardware which some agencies, at least, appear to have in abundance. These scale models were often constructed by the agency or by the contractor who built the facility;*
- *locate, catalog, and archive technical printed materials for the various scientific projects and programs. NASA generated a massive amount of these materials during the Apollo program, for example;*
- *locate, preserve, and archive film footage and data from selected scientific tests and research programs that relate to the "Man in Space" historic theme. For example, each engine/structure test at the Marshall Space Flight Center was filmed for review and analysis;*
- *provide better support for museums associated with scientific and technological institutions. Increased funding to facilitate collection-development in the above areas, in addition to scientific and technological objects, is vital.*
- *provide increased support for the existing offices of agency historians and archivists, and financially support the increased dissemination of historical documentation and official agency histories, already available but little known outside the agency;*
- *encourage increased private and public participation in an effort to preserve America's scientific and technological past. Participation could take many forms. The National Oceanic and Atmospheric Administration (NOAA), for example, conveyed the Gaithersburg Latitude Observatory, an NHL observatory, to the City of Gaithersburg for use as a museum and interpretative center. Organizations like the American Astronomical Society, and the U.S. Space Society could become increasingly involved in the determination of what parts of the Nation's scientific heritage are worthy of retention in the first place.*
- *integrate consideration for those significant structures and facilities that may be affected by an agency's project or program very early in mission planning.*

Problems in implementation

These are just a few of the mitigation measures that could preserve the essential historical significance of science and technology facilities that must be modified in the future. As this report has stressed, there is no legal requirement for preservation of historically important artifacts. Permanent retention of existing records and data of scientific facilities, as well as access to them by the interested public, would be a cost-effective method to preserve some elements of our scientific heritage.

In terms of the implementation of such measures, the question of short-term cost, while a legitimate concern for both public agencies and private institutions, should not be the central focus of discussion. A more important issue concerns how such measures should be pursued over the long-term, and how they can be incorporated into a general management strategy for preserving the nation's scientific and technical heritage. Current treatment of historic highly technological facilities tends to be piecemeal, "compliance"-directed, and insufficiently integrated with other management concerns and needs. Simply selecting the most inexpensive or most passive "mitigation" measures, such as photographic recordation, will neither meet the long-term preservation needs, nor the stewardship responsibilities, of the Federal agencies involved. As described in the next, final chapter of this analysis, a balanced but comprehensive approach is needed to best serve the public interest.

CHAPTER 7:

Conclusions and recommendations

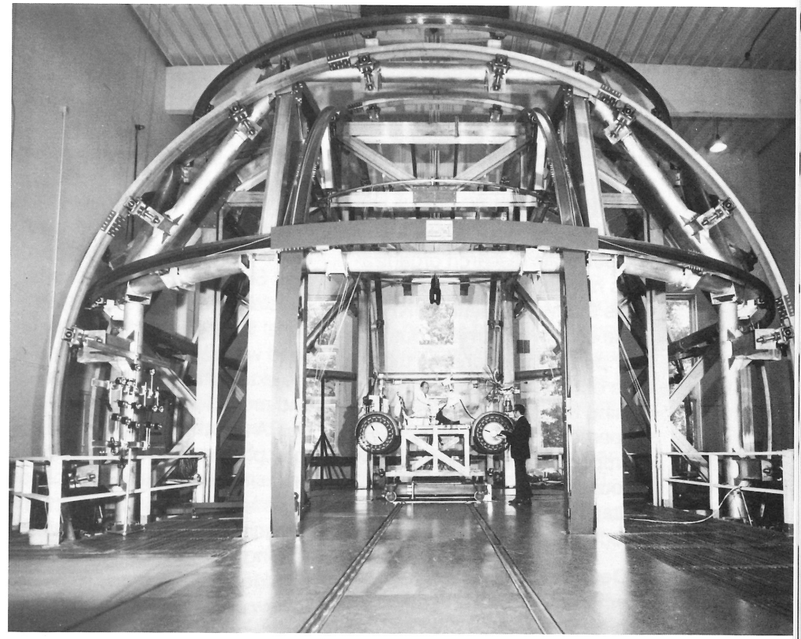
The central theme of this analysis is the notion that a balance must be struck between the needs of active scientific and technological facilities and the need to preserve the physical evidence of America's scientific heritage. Preceding chapters have described the particular requirements of research organizations, investigating the foundations of their apprehensions about complying with Federal historic preservation law. This analysis has also discussed how the Section 106 process works to ensure consideration of historic values in Federal and federally assisted projects drawing upon past Council cases as well as discussions with past and present facility managers and research personnel. Finally, this report has explored both the criteria whereby facilities and objects are deemed "historically significant" and the problems that might arise in making such judgments.

The preceding analysis has generated a number of conclusions which will be explored and justified in the following pages. Recommendations to better integrate preservation considerations into the conduct of Federal and federally assisted scientific endeavors conclude this report.

Conclusions

☐ **Although the current number of properties recognized as significant for historic scientific and technological achievements is fairly small, it is likely to increase as the era of World War II and its immediate aftermath continues to recede into the past.**

The 1940s and the early 1950s were characterized by unprecedented scientific and technological achievement. As physical vestiges of those national achievements reach the 50-year threshold typically used to determine historic significance under NHPA, the pool of historically significant scientific and technological properties may increase dramatically. At the same time, continued advances



The Section 106 review process is flexible enough to accommodate the legitimate needs of the scientific and engineering community. The preserved, now-inactive Redstone test stand at Marshall is regularly visited by bus tours from the Alabama Space and Rocket Center, left. Such public interpretive use may be inappropriate for active research facilities such as Goddard Space Flight Center's magnetic test facility, also an NHL.

in science and technology over the next decade and beyond into the twenty-first century can be expected to increase pressures on scientists, engineers, and managers to remove or alter historic facilities in order to keep those facilities up-to-date to meet changing technologies and uses.

☐ **The assumption expressed by some that the requirements of the National Historic Preservation Act are fine for road construction or urban redevelopment but inappropriate for scientific research and development must be rejected.**

Scientific research and the space program are indeed important national priorities, but they are not necessarily more important than other national priorities such as rebuilding national infrastructure or providing affordable housing to Americans. Federal agencies and scientific research organizations have an obligation to address the requirements of NHPA in the course of carrying out their primary missions. In the case of Federal agencies owning historically significant properties, these agencies have an important stewardship role for our collective cultural heritage that they are obligated to recognize and address.

☐ **Despite the conclusion that scientific research and high technology operations should be considered no differently from other national priorities with regard to applicability of historic preservation law, there is validity to the notion that the scientific research process requires an unusual degree of flexibility in the planning and execution of research work.**

It is difficult in many cases for scientists to state explicitly what effects proposed projects might have on historic properties. Research plans evolve and change during the research process; therefore, it may be impossible to specify precisely the consequences of their work with regard to physical effects on historic equipment or facilities.

☐ **Historic preservation concerns can and should be accommodated expeditiously in a way that focuses on the extremely small percentage of Federal or federally assisted projects that might have adverse effects on highly significant and historic facilities.**

PAs, or other mechanisms, that provide for tailoring of the "normal" Section 106 process to the special needs of active, operational facilities should be pursued with relevant agencies. To the extent that the regulations and procedures implementing NHPA and the application of historic preservation concepts can be fine tuned to meet the legitimate needs of the affected agencies, this should be done. Among other things, PAs can provide for stricter time limits on review and consultation that can meet concerns about expediting agency decisionmaking where necessary.

☐ **The scientific community in some cases has displayed unfamiliarity with the requirements of NHPA, and appears to perceive a threat of extended delays and other problems where there is little direct supporting experience.**

Despite the fact that Federal agencies have been subject to historic preservation statutes for at least 24 years, relatively few cases involving effects on highly technical properties have gone through Section 106 review. Most Federal agencies and scientific research organizations involved with historic scientific and technical facilities do not fully understand the fine points of the Federal historic preservation review process as set forth under Section 106, much less appreciate how it could be integrated more effectively into their respective programs.

Some scientists and facilities managers, unless they have had direct experience with historic preservation project review in the past, continue to assume that Federal "historic preservation laws" mandate historic preservation, i.e., the unqualified retention of historically significant properties. Section 106 mandates that historic values be *considered* in overall planning for a project or program; any decision concerning preservation is made only after preservation values have been weighed against other values. There is no Federal law that requires retention of any historic property.

This perception was apparent in Council negotiations with NASA about their PA. It also has been a factor in discussions

with NSF over an agreement covering their support of observatories. A fuller understanding of the Section 106 review process and its intended outcome could make for greater appreciation on the part of some Federal agencies concerning the possible historic significance of programs they have supported. It could also institutionalize consideration for historic values in the future within those agencies.

☐ **With some notable exceptions, historic preservation is rarely seen as a mechanism for meeting other agency objectives. Too often, it tends instead to be viewed primarily as a "compliance problem."**

The provisions of NHPA apply to all Federal agencies of the Executive Branch. As one piece of Federal environmental legislation, it can be compared to the National Environmental Policy Act (NEPA)--a Federal policy aimed at the full airing and consideration of environmental issues and, in the context of project decisions, with the result of more informed planning and decisionmaking. However, discussions with a variety of Federal managers for this study and direct experience by the Council staff suggests that many affected Federal agencies believe the goals of the Federal preservation program to be too nebulous to be incorporated into a coherent environmental program. Wetlands, for example, can be analyzed, assessed, and even replaced in some instances; water quality can be determined; threatened wildlife populations can be estimated. Effects on historic properties are not as easily measured. In addition, agencies often assert that the limited budget available for performing their primary "mission" automatically relegates historic preservation to a minor role in their overall program. NASA, with its visitor centers and aggressive public affairs program, is a notable exception.

This general Federal agency perception, however, coupled with the tendency to view historic facilities as simply the functional engineering structures that enabled significant events, tends to devalue the historic significance of a given facility. Practical advantages associated with historic site status may also be sacrificed. For example, it is possible that facilities formally recognized as "historic" may be better protected against the vagaries of agency budget cuts or outside development pressures, although there is conflicting evidence on this point.

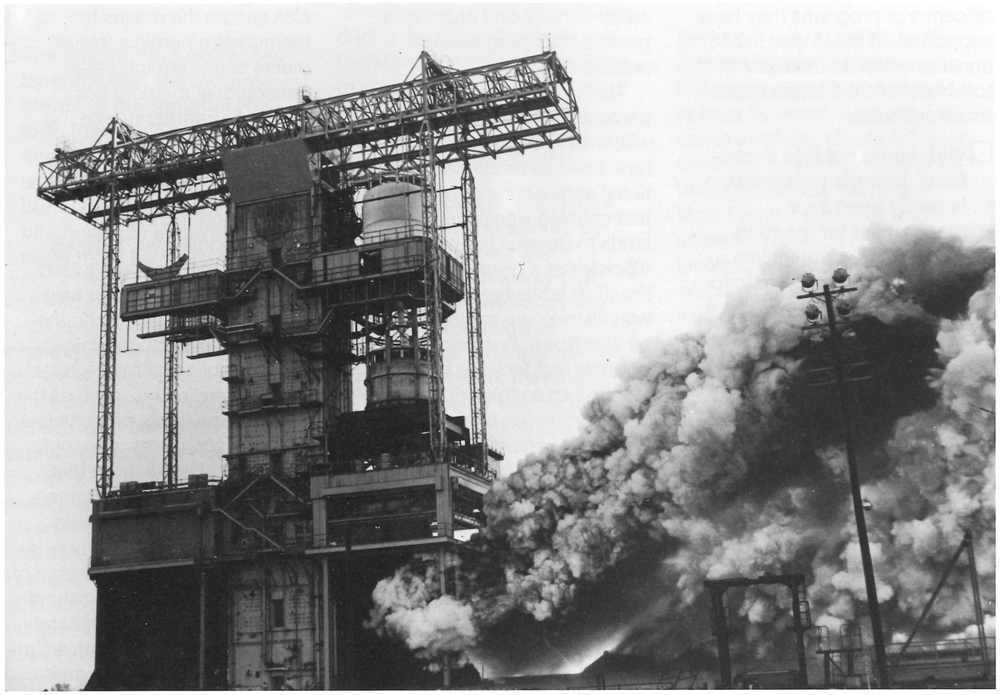
The tendency to view the provisions of NHPA as merely one more hurdle in the race toward "environmental clearance" results in a loss of considerable public relations value. For example, the good will that could be generated by a concerted effort to preserve in place and present to the public structures illustrative of the magnitude of the moon landing effort could help convey the message that the kinds of problems that NASA is currently experiencing with the Shuttle and the Hubble telescope are inevitable effects of complicated scientific and engineering endeavors. Scientists rightly deplore the mediocre national standard of scientific education, yet they frequently overlook an obvious way to elevate it through historic preservation. History and science are not inherently incompatible. On the contrary, by preserving instructive physical evidence of the Apollo lunar program, among others, scientists and their agencies secure the means to memorialize heroic achievements of this era long after generational memory has dimmed. Familiarity with this rich scientific legacy will undoubtedly encourage young people to seek careers in science and technology.

At the local level, facilities and equipment of recognized historic significance can help educate communities and their elected officials about unique concerns of sensitive, high-technology installations, such as the need for low levels of municipal lighting near a telescope, or for local zoning ordinances that could help restrict electromagnetic interference from solid waste disposal sites. These installations should be a source of pride, not the breeding ground for local conflicts. The natural civic pride that accompanies important and historic research facilities is not typically exploited in an effective manner. Los Alamos laboratories and Kennedy Space Center are notable exceptions; they are also the major employers in their locales.

☐ **Council regulations and the Section 106 review process are flexible enough to accommodate the legitimate needs of the scientific and engineering community and their activities at historic facilities.**

Generally, grants for projects using existing physical plans without modifications do not take the form of undertakings within the meaning of Section 106 and, therefore, will be spared review. Similarly, work that only modifies existing equipment will have little if any effect; either no Section 106 review would be required or a summary finding of no effect would satisfy compliance requirements. Telescope improvements envisioned by institutions like the California Institute of Technology at Palomar Observatory or the University of Chicago at Yerkes Observatory, should not produce adverse effects. On the other hand, a plan affecting the integrity of one of the major instruments at either of these institutions could be a significant Section 106 issue. Material alterations to buildings housing scientific facilities, particularly if the structure's exterior or interior is well-known, would affect that facility; nevertheless, unless there were major changes to an important piece of scientific architecture such modifications would not be adverse.

These conclusions incorporate both the concept of materiality, i.e., the quantity of change proposed, and the concept of quality, i.e., change of character or use, as opposed to the natural, ongoing change and improvement to and in structures or equipment as they are continually subjected to minor change while they continue to function for their original purpose.



The preservation community must gain a deeper understanding of the role various facilities and structures, such as the propulsion and structural test facility at Marshall Space Flight Center, played in the advancement of scientific research.

☐ **All parties involved in determining the future of America's historic scientific equipment and facilities need to have a thorough understanding of what makes them significant and why.**

A clear understanding of the significance of a facility, structure, or object is vital to the discussion of preservation options. This understanding, which should be predicated on agreement about exactly what is historic, is necessary if a consensus on how best to convey that significance to future generations of Americans is to be reached.

This degree of understanding is equally important for members of the historic preservation community, scientists, and managers. The latter can and should take a more active role inasmuch as they are often in a better position to grasp and help judge the historic importance of their own facilities.

☐ **The historic preservation community needs to work with the scientific and engineering communities to gain a better understanding of how best to ensure the appreciation of the historically significant scientific facilities, as well as any associated historically significant objects those facilities created.**

The preservation community must gain a deeper understanding of the role various facilities and structures, e.g., the Propulsion and Structural Test Facility at Marshall Space Flight Center, or the Wilson Observatory in California, played in the advancement of scientific research, if they are to determine how best to communicate this to the public. Given the various roles these facilities played both behind-the-scenes and in the public eye, how can this be presented? Should every historically significant object be preserved simply because it may be a unique or rare product of science and technology, e.g., a new space suit, or a Mercury Capsule? These questions need to be addressed as part of a developing consensus.

Discussions with Smithsonian Institution and other museum staff as a part of this study are instructive. These discussions indicate that scientific development of computers, cameras, and other technologically important but less prominent components of space vehicles are of great interest to the public. However, if their impact is to be maximized, these objects must be interpreted with reference to their historic context and development and, where possible, with illustrations of how their development directly or indirectly currently affects the average person. The National Museum of American History's new permanent exhibit, "The Information Age," illustrates this principle. Under the rubric of space exploration, people want to see and touch actual objects that have been into space--be they capsules, rockets, spacesuits, or more mundane rocks from the moon's surface. People also are interested in the everyday life of astronauts, including their routine activities. An actual sleeping hammock used in the space shuttle is the kind of object that could easily be overlooked when discussing the preservation of man-in-space efforts, but it excites the interest of a child. Detailed printed information about rocket design, NASA missions, and hardware is also valuable, and at the facilities visited for the purposes of this study, it was apparent that this material was quite popular with visitors to these sites.

☐ **Decisions about projects that may affect historic properties need to be made with as complete an understanding as possible of such effects. However, considerations of preservation options should be kept distinct from the peer review process of awarding research grants and the determination of research priorities central to the scientific research process.**

Scientists fear that the impact a proposed research project may have on historic properties ultimately will be considered in determining the project's scientific value. This, in turn, suggests that non-scientists could have a major impact on what kind of research is carried out, and where. There is a real concern on the part of the scientific community that nonscientific issues will either cloud the scientific worth of a proposed activity or result in changes that will make the research less effective or comprehensive.

These two issues, the scientific value of a research activity and the considerations of effect to historic properties, should be kept separate and distinct. The Section 106 process is ideally

designed to reach a consensus on accommodating historic preservation concerns as an activity proceeds; it begins with a bias toward allowing the activity to go ahead. The law states that agencies must "take into account" the effects of their undertakings on historic properties, and afford the Council a reasonable opportunity to comment on those effects. It does not mandate preservation/retention but requires only that preservation values be considered in decisions that would alter or harm historic properties. This should not be construed by the historic preservation community as a license to scrutinize and rewrite research plans and decisions much less to open them to public debate.

☐ **Federal agencies engaged in scientific research should better acknowledge their responsibilities as stewards of America's scientific heritage and strengthen their tangible commitment to preserving the Nation's scientific legacy.**

Inasmuch as scientists are potentially among the best judges of the historic value of their enterprises, it may be possible to instill more interest in preservation in those scientists who work in historic facilities. Indeed, future generations may be better served through encouraging scientists to take an active preservation role than by imposing additional layers of third-party control on managers of facilities. Plans, maps, illustrative models, and other by-products of historic events are usually on hand in the immediate aftermath of an activity; the key is to ensure their preservation and accessibility beyond that activity's completion. Scientists who are conscious of their unique responsibility as interpreters of the past will ensure that important remnants of past events are not lost. To the extent that this kind of conservatorship is already done for the benefit of scholars seeking to verify or understand past research, for public information, or public relations purposes, this will not impose an additional burden on agencies' or facilities' resources.

Throughout the Federal Government, the current personnel designated to serve as Federal Preservation Officers (or the equivalent) in accordance with Section 110(c) of NHPA often have insufficient expertise or training in historic preservation. Typically they perform their preservation function in a small amount of time taken from their other duties. They have inadequate staff to assist them, and limited additional resources. As indicated in previous Council reports to Congress, including the *Regulations Effectiveness Report* (January 1990), this should be corrected.

☐ **The intellectual resources of the scientists and managers who have recently retired or are nearing retirement is an asset that the Federal government should not overlook.**

Whether through soliciting assistance from such individuals in developing visitor centers or displays or through more formal projects supported by the Smithsonian Institution and others designed to record the oral histories of important programs like the manned space program, the relevant agencies should capitalize on the knowledge and experience of this group while these individuals are available.

Recommendations

☐ **Policy and legislation**

■ *The Council strongly recommends that Congress not enact legislation providing exemptions from or waivers of the administration of the national historic preservation program for the benefit of specific Federal agencies or programs. Such statutory exemptions and waivers set a dangerous precedent because they are inconsistent with sound management of our nation's historic resources, and they discourage agencies from negotiating with the Council for flexible, mutually acceptable programmatic agreements tailored to the agencies' needs. Because of the flexibility built into the national historic preservation program, no Federal agency, and specifically no agency concerned with operating scientific institutions and facilities, has made a persuasive case for needing a legislative exemption or waiver.*

These interventions in the established and flexible historic preservation processes are inconsistent with the fundamental principle of the NHPA and detrimental to the sound and effective management of the nation's historic resources.

■ *Future scientific achievement as well as an adequate serving of the public interest is dependent on an understanding of, and excitement for, past scientific successes and failures. Therefore, to the extent that they do not already exist in agency programs, future authorizations for major scientific and technological programs should include public education components that focus in part on the communication of the relevant history of science.*

■ *The Advisory Council on Historic Preservation should take the lead in developing and subscribing to a statement of policy that acknowledges the sensitive relationship between the progress of scientific research and the evolving history of science and its physical manifestations. Such a statement could take the form of a policy memorandum signed by the Chairman of the Council, the National Park Service, the National Conference of State Historic Preservation Officers, and various agency heads that could lay the groundwork for future consultation on specific cases or programs.*

☐ **Public interpretation and education**

■ *In addition to the need for personnel for purposes of compliance with Federal historic preservation law, relevant agencies engaged in funding highly scientific research should provide resources to allow their resident historians and archivists to begin cataloging, or to complete the cataloging and preservation of, various records and documentary media pertinent to their facilities, structures, projects and programs. This will ensure that the public will know where to look and who to talk to find the information they need.*

■ *Other than NASA, which already does quite a bit in this area, Federal agencies also need to strengthen their public outreach programs, through increased direct and indirect support to internal or associated museums.*

■ *Federal agencies and preservationists need to assess how future preservation needs can be met more effectively through public/private sector cooperation. Private corporations engaged in research and development activities have made substantial contributions to the preservation and historical documentation of their own heritage, both through funding support and active preservation of their own historic structures and equipment. Many recent exhibits at the Smithsonian Institution and other museums devoted to scientific and technological themes are largely underwritten by corporate sponsors, and/or feature historic artifacts donated by these companies. The Aerospace Industries Association (AIA), a member organization comprised of approximately 50 corporate members and their subsidiaries, maintains a Washington executive office that could help serve as a clearinghouse for such efforts.*

☐ **Administrative procedures**

■ *Over the next two years, Federal agencies, in cooperation with the Advisory Council on Historic Preservation, should evaluate their current administrative procedures for historic preservation, paying close attention to mechanisms they currently have in place for meeting their responsibilities toward not only NHLs but also properties that are eligible for or listed on the National Register of Historic Places. The Council should recommend measures to improve the effectiveness, consistency, and coordination of those procedures with the purposes of NHPA, as prescribed by Section 202(a)(6).*

■ *The Advisory Council on Historic Preservation, in cooperation with the Smithsonian Institution and NPS, should foster better communication between the preservation and museum community and Federal agencies with the aim of establishing a consensus concerning the kinds of facilities and objects that should be physically preserved and those that could be "preserved" through documentation.*

■ *Scientific and technological agencies need to examine whether their institutional structure is such that a programmatic approach to compliance with NHPA is in their interest and to determine whether their preservation program should be carried out through a centralized office at headquarters or at the individual installation level.*

■ *Federal agencies should examine their existing mechanisms for public involvement to ensure that these are adequate to sufficiently include those parties with legitimate historic preservation interests in the decisionmaking process.*

Once this is done, certain questions need to be addressed. These might include: "How are such properties and the scientific and technological history behind them being presented to the public?" and "is there a national interest in such efforts, and if so, what is it?"

- *Federal agencies need to determine more precisely the management status of historic properties for which they may be responsible where questions exist. For example, some agencies have overlapping interests or jurisdictions for the care of facilities. Agencies must examine existing legal responsibilities, as well as interests among the owners, managers, and users of these properties with regard to historic preservation. They must ensure that there are currently adequate incentives for preservation and/or public interpretation.*

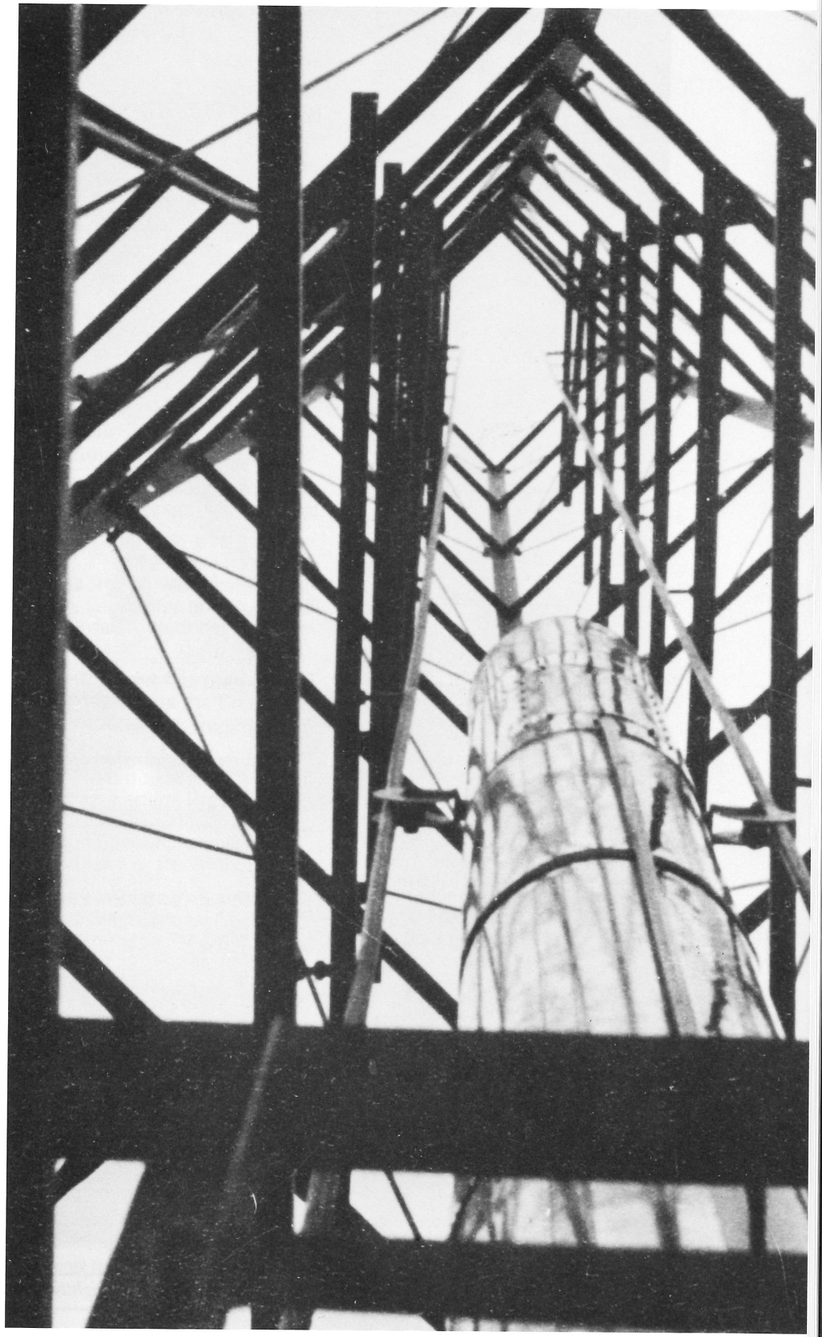
☐ Staffing and training

- *The Department of the Interior, in cooperation with the Smithsonian Institution, should provide technical assistance and advice to those scientific facilities around the nation interested in identifying and evaluating the historic nature of their facilities. This information should include innovative ways in which agencies may be able to address preservation needs and responsibilities. SHPO staff in affected states should also receive such technical assistance and advice to enhance their ability to make appropriate judgments.*
- *In key states which contain many potentially important historic resources of a scientific or technological nature, the Council, NPS, and NCSHPO should take the lead in working with affected agencies, private institutions, and SHPOs to facilitate interaction in workshops and other forums.*
- *The Advisory Council on Historic Preservation should designate one or more staff members to serve as contacts on scientific and technological programs and projects. These individuals should become thoroughly familiar with existing Federal programs and the types of historic facilities which may be affected by them.*
- *NASA, NSF, USAF, and DOE should each acquire personnel with historic preservation expertise for their Washington, DC, offices.*
- *NASA, DOE, and USAF should each designate an individual at the headquarters level to work full-time coordinating historic preservation programs and planning with facilities staff, public affairs offices, and external affairs for their respective agencies. This would include contractors and, where appropriate, visitor's centers and cooperating museums: Smithsonian Institution, Alabama Space and Rocket Center, Oak Ridge, Los Alamos, Cape Canaveral's Air Force Space Museum, etc.*
- *NSF should develop guidelines for NSF support that may affect historic preservation concerns. NSF should also work with recipient institutions to promote preservation of scientific and technological facilities and instruments, in conjunction with NSF's Science and Engineering Education Program. Finally, NSF should actively work with the Council, NPS, and SHPOs to address the variety of matters related to Section 106 on both a project and program-wide basis.*

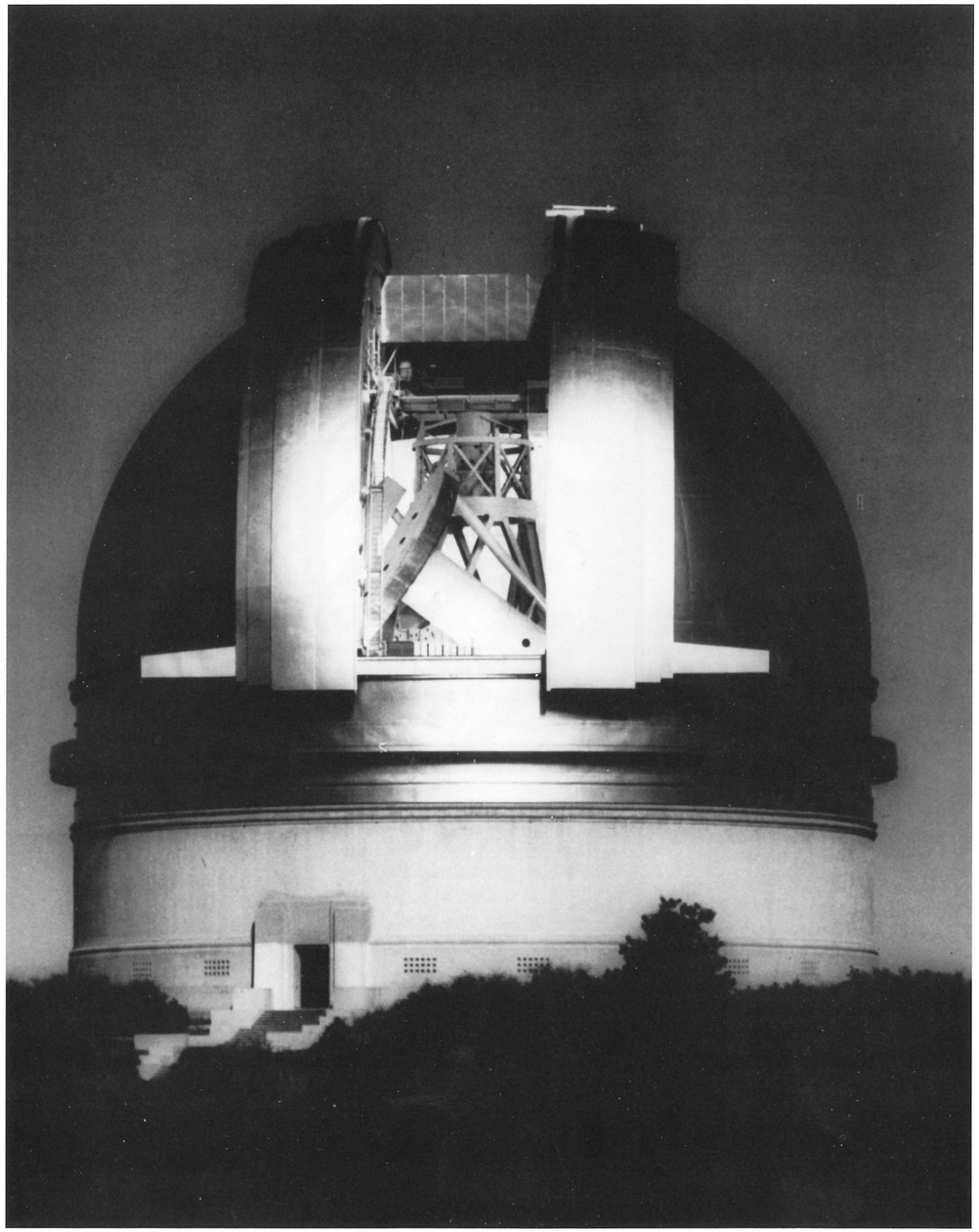
☐ Funding

- *Congress should consider a modest appropriation, supplemental to the NPS Fiscal Year 1992 budget, to record and document particularly vulnerable historic scientific and technical facilities and begin a systematic inventory of such resources in cooperation with agencies and SHPOs.*
- *Specific financial resources required to accomplish related goals should be determined, and discussions initiated toward their attainment. Specific attention should be given by all Federal agencies engaged in scientific research to the kinds of interpretive proposals and attendant costs presented in the NPS's "Man in Space" study of alternatives.*
- *The preservation and scientific communities should discuss with Federal agencies the current and possible future preservation needs of scientific and technological properties, including, for example, whether program funds that have not normally been considered for historic preservation use, such as archival retention, cyclic maintenance, or public history, could be used to assist with physical preservation needs or onsite interpretation of facilities. Money spent to advance historic preservation might well be paid back in numerous educational and other benefits.*

- *Existing policies restricting the use of maintenance funds for inactive or underutilized facilities should be reexamined.*
- *Affected Federal agencies should examine the historic scientific and technical properties in their care to determine funding needs for preservation, including documentation where physical preservation of the facility, structure, or equipment is not realistic.*



Scientists who are conscious of their unique responsibility as interpreters of the past will ensure that important remnants of past events are not lost. This picture, looking up the launching tower of Dr. Robert Goddard's rocket, was taken by Charles A. Lindbergh in 1935.



Mount Palomar Observatory, in nighttime operation.

APPENDIX 1:
Report preparation and acknowledgments

This study was done under the direction of a task force of Council members. The task force included:

Alan Raul, general counsel, the Department of Agriculture (chair)

Dennis Mullins, expert member, Los Angeles, California

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Judith Bausch, librarian/archivist

Robert Meadows, physical plant

The Council received written comments on its *Federal Register* notice from the California Institute of Technology and the University of Chicago as well as the SHPOs of Arizona, Massachusetts, North Carolina, Tennessee, Wyoming, and a member of the staff of the Oregon SHPO.

It also received written comments from a representative of NASA, Palomar Observatory, Lick Observatory, Allegheny Observatory, and Yerkes Observatory on earlier drafts of the report.

Copies of these comments are available from the Council upon request.

Photo credits

Cover and photographs on pages xi, 1, 2, 8, 9, 22-23 (bottom), 27, 31, 34, 44, 47, 50, 51, 57, 60, 65, courtesy of *NASA*. Pages ii, iv, 18, 19, 66, the *Hale Observatories, California Institute of Technology*. Pages viii and 56, the *Space and Rocket Center*, Huntsville, AL. Page xii, Edison National Historic Landmark site, *NPS*. Page 3, *Department of the Army*. Pages 12-13, 14 (top), *Ron Anzalone*, photographer. Page 14 (bottom), *Yerkes Observatory, University of Chicago*. Page 21, *U.S. Navy*. Pages 22-23 (top), *Marcia Axtman Smith*, photographer. Page 26, *Langley Research Center, NASA*. Page 35, *Jet Propulsion Laboratory, California Institute of Technology*. Pages 40 and 41, *Robert Fink*, photographer.

APPENDIX 2:

Congressional letter requesting the analysis

ONE HUNDRED FIRST CONGRESS

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ATTACHMENT 1

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515

STANLEY SCOVILLE
STAFF DIRECTOR
AND COUNSEL

ROY JONES
ASSOCIATE STAFF DIRECTOR
AND COUNSEL

LEE McELVAIN
GENERAL COUNSEL

RICHARD AGNEW
CHIEF MINORITY COUNSEL

September 20, 1989

Mr. John F. W. Rogers
Chairman
Advisory Council
on Historic Preservation
1100 Pennsylvania Avenue NW
Washington, DC 20004

Dear Mr. Rogers:

As part of the reauthorization for the National Aeronautics and Space Administration (H.R. 1759), an issue arose concerning the complexities involved in having properties designated (or determined eligible for designation) as National Historic Landmarks that are also operational and highly technological. Great concern was expressed that the procedures necessary to ensure full compliance with the Historic Preservation Act could interfere with the operations of such facilities, and particularly with the constant need to modify and upgrade them.

We believe that a balance must be maintained between the needs of historic preservation and the needs of operational facilities, and are supportive of both. We also believe that more congruence between these respective needs is possible. For example, the greater participation of active research scientists and managers in preparing memoranda of agreement would assist in ensuring that such memoranda reflect the needs of both parties.

The increasingly technological nature of our society guarantees that future proposed National Historic Landmarks will raise similar issues to those faced here. Because of this, the undersigned hereby request the Advisory Council on Historic Preservation to undertake a comprehensive analysis to examine these issues. Specifically, such an analysis should focus on the properties identified in the two National Historic Landmark Theme Studies, "Man in Space" and "Astronomy and Astrophysics." We request a completed analysis within one year, by September 30, 1990 to be transmitted to the House of Representatives' Committee

Mr. John F. W. Rogers
September 20, 1989
Page two

on Interior and Insular Affairs and the Committee on Science, Space and Technology.

The Analysis should include, but not be limited to, the following issues:

1) Ways to balance the needs of historic preservation and facility operation at highly technological and/or scientific facilities.

2) Impediments to achieving such a balance, such as time delays and security concerns and approaches to minimize such impediments.

3) Procedures to ensure that both historic preservation and scientific/technological communities continue to assist each other in the development and execution of agreements that fulfill the respective needs of historic preservation and facility operation.

Preparation of the Analysis must include active participation of the federal agencies and their grantees and contractors, as well as the historic preservation community. Active scientists and managers should be involved to give their recommendations on how to ensure that agencies can expeditiously fulfill their missions, including research, development and operations.

We look forward to receiving the Analysis, and believe that its recommendations will greatly assist agencies in preserving our nation's history.

Sincerely,

Mr. Bruce F. Vento
Chairman
Subcommittee on National Parks and Public Lands

Mr. Robert A. Roe
Chairman
Committee on Science, Space, and Technology

Mr. Robert J. Lagomarsino
Ranking Member for Parks
Subcommittee on National Parks and Public Lands

Mr. Robert S. Walker
Ranking Republican Member
Committee on Science, Space, and Technology

APPENDIX 3:

Programmatic Agreement among NASA, NCSHPO, and the Advisory Council for management of NASA's National Historic Landmarks

PROGRAMMATIC AGREEMENT
AMONG THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
THE NATIONAL CONFERENCE OF STATE HISTORIC PRESERVATION OFFICERS,
AND THE
ADVISORY COUNCIL ON HISTORIC PRESERVATION

WHEREAS, the National Aeronautics and Space Administration (NASA) undertakes research, development, space mission operations, and management use of its facilities which have been designated as National Historic Landmarks (Landmarks) (Attachment 1); and

WHEREAS, such facilities require frequent modification over the life of agency missions to adapt them to meet the requirements of ongoing NASA programs; and

WHEREAS, NASA has determined that such modifications may have an effect on those Landmarks, and has consulted with the National Conference of State Historic Preservation Officers (NCSHPO) and the Advisory Council on Historic Preservation (Council) pursuant to the regulations (36 CFR Part 800) implementing Sections 106 and 110(f) of the National Historic Preservation Act, as amended (16 U.S.C. 470f and 470h-2(f)); and

WHEREAS, the Department of the Interior, National Park Service (NPS) was invited and participated in the consultation;

NOW THEREFORE, NASA, the NCSHPO, and the Council agree that the programs shall be implemented in accordance with the following stipulations in order to take into account the effect of the programs and specific undertakings on the Landmarks.

Stipulations

NASA will ensure that the following measures are carried out.

I. Categories of Activities

A. When the proposed undertaking involves any of the following activities, NASA shall consult with the appropriate SHPO and, as necessary, the Council in accordance with Stipulation II:

1. Demolition, dismantling, or relocation of original engineering structures, or of buildings housing facilities:

2. Removal or excessing of significant elements of the Landmarks specifically named on the National Register nomination forms;

3. New construction not compatible with major portions of the original structure or which alter the characteristics of the facility which were specified as the reason for its Landmark designation; or

4. Changes in function, purpose, or use of a facility.

B. When the proposed undertaking is limited to the following activities that will not alter the characteristics of the facility which were specified as the reason for its landmark designation, NASA shall develop and implement mitigation measures in accordance with Stipulation III:

1. Replacement of historic hardware or components;

2. Modification of the original structure of equipment used in engineering structures, or buildings housing facilities; or

3. New construction compatible with existing structure, purpose, and operation of the facility.

NASA shall include a description of such activities and mitigation measures in the annual summary of its activities prepared pursuant to Stipulation IV.A.

C. When the proposed undertaking involves none of the activities specified above, NASA may proceed without consultation or the implementation of mitigation measures.

II. Consultation Process

A. Consultation required under Stipulation I.A. shall be conducted as follows:

1. NASA shall provide the following documentation to the SHPO for review:

a. a description of the undertaking, with photos, maps, and drawings;

b. a description of the affected Landmark;

c. a description of the effects of the undertaking on the affected Landmark;

d. a description of alternatives to the proposed action, which were considered if any, and reasons not chosen;

e. a description of any mitigation measures proposed;

f. a description of NASA's effort, if appropriate, to obtain and consider views of affected interested persons on the proposed undertaking, including a copy of any comments received; and

g. the planning and approval schedule for the proposed undertaking.

Whenever feasible, NASA shall give the SHPO advance notice that such documentation is under preparation, and advise the SHPO of a date certain that it intends to submit the documentation to the SHPO.

2. The SHPO shall respond to a written request for consultation (accompanied by the documentation specified in Stipulation II.A.1) within 20 working days, and agree, conditionally agree, or disagree with NASA's proposal.

3. If NASA does not accept the SHPO's conditions, or if NASA and the SHPO disagree, NASA shall notify the Council and forward copies of the documentation specified in Stipulation II A.1, above, along with other information relevant to the dispute.

4. Within 20 working days, the Council shall either: (1) attempt to resolve the dispute; (2) provide NASA with recommendations to be taken into account in implementing the activity; or (3) decide to comment, and comment within 45 working days of that decision. At NASA's request, the time periods in Stipulations II.A.2 and II.A.4 will run concurrently. In exceptional circumstances NASA may request accelerated consideration under Stipulations II.A.4 and the Council will make a good faith effort to accommodate such requests. The Council may consult with the National Park Service of the Department of the Interior during its review period.

B. The Council and the NCSHPO recognize that operational emergency situations may arise where NASA must take immediate action without prior consultation with the appropriate SHPO or the Council. In such situations, NASA shall notify the Council and the SHPO of such actions as soon as practicable.

III. Mitigation

Mitigation measures shall be carried out prior to undertaking actions specified in Stipulations I.A. and I.B.

A. Recordation

1. Recordation shall be done in accordance with the Secretary of the Interior's "Standards for Architectural and Engineering Documentation" (Standards) (*Federal Register*, 48 FR 190, pp. 44730-44734, September 29, 1983).

2. Because original "as-built" Drawings and other records are on file at the installations containing Landmark facilities, documentation will normally include the following: (1) reproduction of existing "as built" drawings and site plans modified on standard size (19 x 24 or 24 x 36) mylar; and (2) provision of black and white archival quality photos with large format negatives of exterior and interior views, as appropriate, as well as special technological features or engineering details.

3. Original copies of all documentation shall be provided to the Secretary of the Interior in accordance with the Standards for incorporation into the National Architectural and Engineering Records in the Library of Congress as provided in Section 101 of the National Historic Preservation Act and implementing procedures. Copies of the documentation shall also be provided to the appropriate SHPO.

B. Salvage

NASA will apply its agreement with the Smithsonian Institution (NSA Management Instruction 4310.4) to determine appropriate retention and curation activities with respect to significant artifacts.

IV. Continuing Coordination

A. On or about December 1, 1990, and annually thereafter, NASA will provide a summary of its activities under this Agreement to the Council and to the NCSHPO.

B. In consultation with the appropriate SHPO, the Council may review and comment upon individual undertakings when it determines that historic preservation issues warrant such action.

C. NASA will provide appropriate public information about activities under Stipulations I.A. to interested parties upon request.

D. Any party to this Agreement may terminate it by providing 60 days notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination.

Execution of this Programmatic Agreement and carrying out its terms evidences that NASA has afforded the Council and the NCSHPO a reasonable opportunity to comment on its programs affecting Landmarks under Sections 106 and 110(f) of the National Historic Preservation Act, and that NASA has taken into account the effects of its programs on these Landmarks.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

By: [signed] _____ Date: _____
Associate Administrator for Management

NATIONAL CONFERENCE OF STATE HISTORIC PRESERVATION OFFICERS

By: [signed] _____ Date: _____
President

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By: [signed] _____ Date: _____
Chairman

Attachment 1

NASA's NATIONAL HISTORIC LANDMARKS
(as of 2/24/89)

1. **Variable density tunnel** (Langley Research Center, Hampton, VA)
2. **Full scale tunnel** (Langley Research Center, Hampton, VA)
3. **Eight-foot high speed tunnel** (Langley Research Center, Hampton, VA)
4. **Unitary plan wind tunnel** (Ames Research Center, Moffett Field, CA)
5. **Rocket engine test facility** (Lewis Research Center, Cleveland, OH)
6. **Zero-gravity research facility** (Lewis Research Center, Cleveland, OH)
7. **Spacecraft propulsion research facility** (Lewis Plum Brook Operations Facility)
8. **Redstone test stand** (George C. Marshall Space Flight Center, AL)
9. **Propulsion and structural test facility** (George C. Marshall Space Flight Center, AL)
10. **Rocket propulsion test complex** (Stennis Space Center, MS)
11. **Saturn V dynamic test stand** (George C. Marshall Space Flight Center, AL)
12. **Lunar landing research facility** (Langley Research Center, Hampton, VA)
13. **Rendezvous docking simulator** (Langley Research Center, Hampton, VA)
14. **Neutral buoyancy space simulator** (George C. Marshall Space Flight Center, AL)
15. **Space environment simulation laboratory** (Lyndon B. Johnson Space Center, Houston, TX)
16. **Spacecraft magnetic test facility** (Goddard Space Flight Center, Greenbelt, MD)
17. **Twenty-five-foot space simulator** (Jet Propulsion Laboratory, Pasadena, CA)
18. **Pioneer deep space station** (Goldstone Deep Communications Complex, CA)
19. **Space flight operations facility** (Jet Propulsion Laboratory, Pasadena, CA)
20. **Apollo Mission Control center** (Lyndon B. Johnson Space Center, Houston, TX)

APPENDIX 4:

Cooperative agreement between NASA and the Smithsonian Institution for the curation of historic equipment

AGREEMENT BETWEEN THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AND THE
SMITHSONIAN INSTITUTION
CONCERNING THE TRANSFER AND MANAGEMENT OF
NASA HISTORICAL ARTIFACTS

WHEREAS, in the course of its programs the National Aeronautics and Space Administration produces a large number of artifacts, many with great historical value and others with great value for educational, exhibition, and other purposes, relating to the development, demonstration, and application of aeronautical and astronautical science and technology of flight, and will continue to acquire such materials; and

WHEREAS, such artifacts are unique specimens relating to the science and technology of aeronautics and astronautics, and of flight in the atmosphere and space, which may consist of aeronautical and astronautical objects including, but not limited to, aircraft, space launch vehicles, spacecraft (both manned and unmanned), sub-systems of the above, such as rocket engines, pressure suits and personal equipment, instruments, significant recorded data, operating handbooks, drawings, photographs, motion picture film and related documents, audio and video tapes, training devices, simulators, and memorabilia; and

WHEREAS, the Smithsonian Institution is charged with the responsibility to preserve for perpetuity artifacts representative of aviation and space flight; to collect, preserve, and display aeronautical and space flight equipment of historical and educational interest and significance; to serve as a repository for scientific equipment and data pertaining to the development of aviation and space flight; and to provide educational material for the historical study of aviation and space flight.

THEREFORE, under authority set forth in Section 203(b)(6) of the National Aeronautics and Space Act of 1958, as amended (72 Stat. 430; 42 U.S.C 2473(b)(6); Section 4 of the Act of August 30, 1961 (75 Stat. 415, 20 U.S.C. 80c); and Sections (4) and (8) of the National Air Museum Amendments Act of 1966 (80 Stat 310, 311; 20 U.S.C. 77a, 77d), the National Aeronautics and Space Administration (hereafter called "NASA") and the Smithsonian Institution (hereafter called "Smithsonian") enter into this Agreement concerning the transfer and management of those artifacts having such historical and educational or other value which have emerged and which will emerge from the aeronautical and space programs administered by NASA.

1. NASA shall offer to transfer to, and the Smithsonian may accept as rapidly as reasonably possible, such artifacts under NASA control which become available, after programmatic utility to NASA or other governmental agencies has been exhausted, although, in extraordinary circumstances, exceptions or alternative dispositions can be made by NASA. Before the decision to make an exception or alternative disposition is made, the proposed action shall be referred to the Joint Artifacts Committee (established in paragraph 4, below) for consideration. In addition, NASM may, pursuant to the procedures contained in paragraph 4, call a special meeting of the Joint Committee to discuss the transfer or preservation of items of unusual historical interest that NASA has not yet declared to be artifacts.

In either instance, if no consensus can be achieved by the Joint Artifacts Committee, the issue shall, upon request of either NASA or NASM, be referred to the NASA administrator and the Director of NASM for consideration. In the event agreement still cannot be reached, the NASA Administrator will decide the issue. NASA undertakes no obligation to provide financial support to the Smithsonian.

2. The Smithsonian Institution's National Air and Space Museum (NASM) will accession into its National Collections and accept responsibility for the custody, control, protection, preservation, and display of such artifacts transferred by NASA both in the Museum itself and on loan to NASA and other appropriate organizations in a manner consistent with the prevailing collections policy of NASM. If NASM refuses a request from a NASA component or visitor center for a loan of a NASA artifact, or states its intention to terminate or not renew an existing loan to NASA, NASA may call a meeting of the Joint Artifacts Committee at which the reasons for and possible alternatives to the denial will be discussed. Loans of artifacts to NASA shall be made for periods of from three to five years, with the expectation that renewal will be granted. The NASM may specify reasonable curatorial practices to be followed by NASA components or visitor centers with respect to loaned NASA artifacts, and NASA will implement these practices to the extent practicable.

3. In connection with the NASA artifacts transferred to the Smithsonian, it is understood that in no instance shall a NASA artifact be finally disposed of to an agency other that the United States Government, or destroyed, before an opportunity is extended to NASA to reacquire, not on a basis of purchase but of reasonable defrayment of the costs involved, custody and control of the artifacts. Further, in the event that NASA determines that an item declared an artifact and transferred to the Smithsonian has renewed technical utility with respect to NASA's programs, the NASA Chair of the Joint Artifacts Committee may request NASM to loan the item back to NASA. NASM will make a good faith effort to comply with the NASA request in light of NASA's stated need and the potential impacts on the NASM collection and/or operations. In utilization of this procedure, both NASA and the NASM will work promptly and closely to minimize any adverse impact that the loan could have on NASM operations. Cost of shipping and packaging the item for return to NASA will be borne or reimbursed by NASA.

4. The Smithsonian and NASA will establish a Joint Artifacts Committee to collect information on and consider issues relating to NASA artifacts and their transfer to the Smithsonian. This charter includes but is not limited to, those issues identified for Committee consideration in paragraphs 1 and 2 above. It is anticipated that the Committee will meet at least two times per year, although either NASA or NASM may call a special meeting on 30 days notice.

5. The agreement shall be effective for five years from the date of the latest signature. Unless written notification is given by either party at least six months prior to expiration, it will be renewed automatically for an additional five years.

By: [signed] _____ Date: _____
Noel W. Hinners, Associate Deputy Administrator
(Institution) National Aeronautics and Space Administration

By: [signed] _____ Date: _____
Martin Harwit, Director
National Air and Space Museum, Smithsonian Institution

APPENDIX 5:
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Notes